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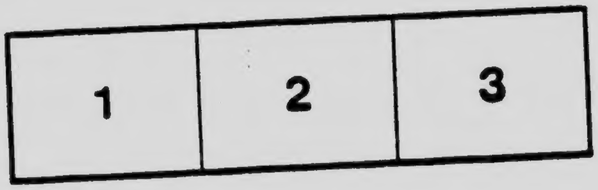

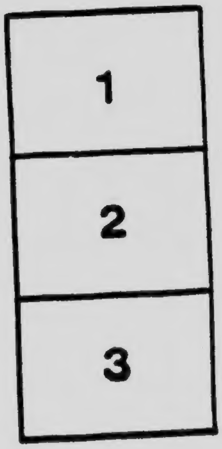

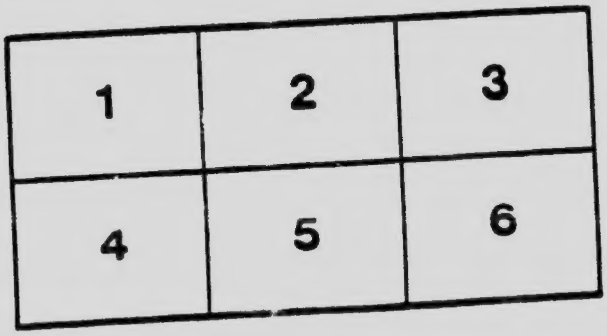

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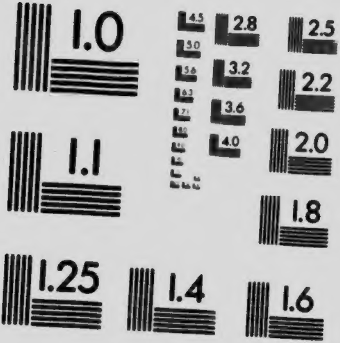

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CANADA
DEPARTMENT OF MINES
MINES BRANCH
HON. W. TEMPLEMAN, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER;
EUGENE HAANEL, PH.D., DIRECTOR.

AN

INVESTIGATION

OF THE

COALS OF CANADA

WITH REFERENCE TO THEIR ECONOMIC QUALITIES:

AS CONDUCTED AT McGILL UNIVERSITY, MONTREAL
UNDER THE AUTHORITY OF THE DOMINION
GOVERNMENT

IN SIX VOLUMES

BY

J. B. PORTER, E.M., D.Sc.

AND

R. J. DURLEY, MA.E.

ASSISTED BY

THEOPHILE C. DENIS, B.Sc., EDGAR STANSFIELD, M.Sc.
AND A STAFF OF SPECIAL ASSISTANTS.

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THE
COALS OF CANADA:
AN ECONOMIC INVESTIGATION

VOL. V

APPENDIX III

DETAILED RESULTS
OF THE
GAS PRODUCER TRIALS

BY

R. J. DURLEY

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[1] This list contains only the samples which were included in the producer trials. A complete list of all samples taken is given in Vol. I, p. 8 and Vol. II, p. 181.

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DETAILED RESULTS
OF THE
GAS PRODUCER TRIALS
BY
R. J. DURLEY

INTRODUCTORY

In the autumn of 1906, the Canadian Government, through Dr. A. P. Low, Director of the Geological Survey, decided to undertake a study of the fuels of the Dominion, somewhat on the lines of the fuel tests which had already been commenced by the United States Geological Survey. But inasmuch as the Government had not, at Ottawa, any suitable mechanical laboratories, and as research work had already been done by the Mining Department of McGill University on a number of western coals, Dr. Low invited Dr. Porter, the head of that department, to undertake the larger investigation. This proposal was approved by the University governors, and Dr. Porter was authorized to carry out the tests in the University laboratories, without charge; on the understanding that the Government would pay for such apparatus as might be required to supplement the existing equipment, and to make good all additions to the salaries, wages, and supplies accounts, rendered necessary by the investigation. At the request of Dr. Low, also, the Intercolonial, and Canadian Pacific railways, very generously agreed to haul the material amounting to many hundreds of tons—free of charge.

Shortly after the commencement of the investigation the Dominion Department of Mines was created, under the Hon. William Templeman, as Minister of Mines, and Dr. A. P. Low, as Deputy Minister; and the investigation, together with all matters relating to economic minerals, was transferred from the Geological Survey, to the Mines Branch, under the Directorship of Dr. Eugene Haanel. The original arrangement, was, however, in all other respects, continued without change.

From the beginning it was intended to confine the investigation to the coals and lignites of the Dominion; and the following points were covered by the scheme:—

Sec. I.—General organization and administration.
II.—Preparation of a general summary report on Canada's coal fields and coal mines.
III.—Sampling in the field.
IV.—Crushing the samples and preparing them for treatment.
V.—Washing and mechanical purification.
VI.—Coking trials.
VII.—Steam boiler trials.
VIII.—Producer, and gas engine trials.
IX.—Chemical laboratory work, and miscellaneous investigations.

TECHNICAL STAFF.

The technical staff engaged in the investigation, comprised:—

(1). J. B. Porter, E.M., Ph.D., D.Sc., Professor of Mining Engineering, McGill University—Responsible for the organization and general direction of the investigation, and directly in charge of Sections I, IV, and V, and VI (in part).

(2). R. J. Durley, B.Sc., Ma.E., Professor of Mechanical Engineering, McGill University—In charge of Sections VII and VIII.

(3). Théo. C. Denis, B.Sc., Mines Branch, Department of Mines, Ottawa—In charge of Sections II and III (in part).

(4). Edgar Stansfield, M.Sc., Chief Chemist—In charge of Section IX, and Sections III and VI (in part).

(5). H. F. Strangways, M.Sc., Dawson Fellow in Mining, McGill University—Assistant in Sections IV and V, 1907.

(6). H. G. Carmichael, M.Sc., Dawson Fellow in Mining, McGill University—Assistant in Sections IV and V, 1908.

(7). E. B. Rider, B.Sc., Demonstrator in Mining, McGill University—Assistant in Sections IV and V, 1909-10.

(8). Chas. Landry, Chief Mechanic of Mining Department, McGill University—Foreman in Sections IV and V.

(9). J. W. Hayward, M.Sc., Assistant Professor of Mechanical Engineering, McGill University—Assistant in charge of Section VII 1907, and preliminary work in Section VIII.

(10). J. Blizard, B.Sc., Lecturer on Mechanical Engineering, McGill University—Assistant in charge of Section VII 1908, and Assistant in Section VIII.

(11). D. W. Munn, M.A., B.Sc., Demonstrator in Mechanical Engineering, McGill University—Assistant in Sections VII and VIII.

(12). G. L. Guillet, M.Sc., Demonstrator in Mechanical Engineering, McGill University—Assistant in Section VII.

(13). G. Killam, M.A., B.Sc., Demonstrator in Mechanical Engineering, McGill University—Assistant in Section VIII.

(14). J. S. Cameron, B.Sc., Demonstrator in Mechanical Engineering, McGill University—Assistant in Section VIII.

(15). A. Balmfirth, Superintendent of McGill University Power House—Foreman in Section VII.

(16). J. Gardner, Foreman in Section VIII.

(17). J. Hoult, Fireman in all tests of Section VII.

(18). J. H. H. Nicolls, B.Sc., Assistant Chemist—Assistant in Section IX 1908, 1909.

(19). R. T. Mohan, B.Sc., Assistant Chemist—Assistant in Section IX 1908.

(20). P. H. Elliott, M.Sc., Assistant Chemist—Assistant in Section IX 1908.

(21). E. J. Conway, B.Sc., Assistant Chemist—Assistant in Section IX 1908.

(22). W. B. Campbell, Assistant Chemist—Assistant in Section IX 1909.

(23). R. S Boehner, M.Sc., Demonstrator in Chemistry, McGill University—Assistant in Section IX 1908, 1909.

(24). H. Hartley, B.Sc., Assistant Chemist—Assistant in Section IX 1909.

(25). W. P. Meldrum, B.Sc., of the Department of Chemistry, McGill University—Assistant in Section VI 1909.

(26). H. H. Gray, B.Sc., Demonstrator in Metallurgy, McGill University—Assistant in Section VI 1909.

(27). H. G. Morrison, B.Sc., Assistant Chemist—Assistant in Section IX 1909, 1910.

There were also a number of machinists, mechanics, and labourers, engaged more or less continuously in the several sections.

In addition to the persons above named, the following members of the University staff very materially aided in the progress of the work by giving occasional assistance and advice:—

Alfred Stansfield, D.Sc., Professor of Metallurgy.

H. T. Barnes, D.Sc., Professor of Physics.

Acknowledgment is also due to the Governors of McGill University, and to W. Peterson, C.M.G., Principal; F. D. Adams, F.R.S., Dean; W. Vaughan, Esq., Secretary; S. R. Burrell, Esq., Chief Accountant, and many others.

LABORATORIES.

The laboratories of the Mining and Mechanical Departments of McGill University, in which the tests were made, were built and equipped some few years ago on a scale unequalled at the time in North America, the buildings and apparatus for the Ore Dressing Department alone costing over $150,000, and the Steam Laboratory an almost equal sum. This equipment needed very little augmentation in respect of sampling, crushing, coal washing, steam boiler tests, and chemical analysis; although a number of minor pieces of apparatus had to be purchased, such as extra calorimeters, pyrometers, thermometers, etc., etc.

In the matter of producer and gas engine tests, larger expenditure was necessary, as the University equipment was on too small a scale for the extensive tests contemplated. An addition 25 × 70 was, therefore, built to the Ore Dressing Laboratory, and equipped with a complete plant of the most modern type, the cost for building and plant being approximately $12,000. A detailed description of this plant, with cuts of the apparatus, etc., will be found in Vol. II, Part VIII, of the Report, and similar descriptions of the apparatus used in the other parts of the investigation will be found in the other parts.

THE INVESTIGATION.

Sampling in the Field.

Sixty-three separate mines or seams were specially sampled for the investigation. The work of sampling was always done by a responsible member of the technical staff, and every precaution was taken to ensure reliability. The general rules governing this sampling and the detailed descriptions of the work of sampling at the several mines are fully stated in Vol. I, Part III.

A list of the samples arranged in geographical order is given in the table of contents of each volume of the appendices III, IV, V, and VI, and is also printed in the text of the Report proper, Vol. I. pp. 8 to 11, and Vol. II, pp. 181 to 184.

Crushing and Sampling in the Laboratory.

The main samples on their arrival at the testing plant at McGill University were all crushed to go through a 2" screen, mixed thoroughly on a large granolithic sampling floor, sampled for the chemist, etc., and finally resacked, sealed, and sent to a dry room for storage while awaiting test.

The methods of sampling are stated in detail in Vol. I, Part IV.

The smaller subsidiary samples were sent directly to the chemical laboratory, where they were stored in sealed vessels until required.

Mechanical Purification.

Each main sample was experimentally treated in the laboratory with heavy solutions, and the fractions analysed with a view to determining the probable results of washing. In all cases where these preliminary tests gave favourable results, a large lot was treated in the coal washing plant of the University, and this work was checked by a further series of tests with heavy solutions.

It would, of course, be possible in a laboratory to do extremely thorough washing at an expense disproportionate to the value of the coal; but this was not attempted the aim being to reproduce commercial conditions. From comparative tests made between the laboratory work and coal washing in standard plants, it is evident that this end has been attained, and the tests as carried on may be taken in a broad way to represent average commercial work.

The whole subject of coal washing, as well as testing, is dealt with in Vol. I, Part V, and the results of all of the trials are presented in a series of summary tables. The detailed results of each test are given in Vol. III, Appendix I.

Coking Trials.

Coke, as ordinarily manufactured in beehive ovens, can only be produced from bituminous coals possessing particular qualities, but when retort ovens are employed a larger range of coals are available, although even at best there are many coals from which good coke cannot be produced.

Several series of trials were made to test the coking qualities of the various coals in both types of ovens, and also to determine upon a reliable method of producing coke from small quantities of coal, and a method of comparing different cokes in respect of their strength, porosity, etc.

These experiments are described in detail and their results summarized in Vol. I, Part VI, but additional matter relating to special methods of testing, etc., will be found in Vol. VI, Appendix IV.

Boiler Trials.

The boiler trials were conducted in the boiler testing room of the University, the method used being as far as possible in accordance with standard practice.

The boiler, which is a Babcock and Wilcox, rated at 60 H.P., was thoroughly cleaned and tested before the trials were commenced, and standardizing tests were run with Georges Creek coal. The series included 72 trials, each of which lasted at least ten hours.

The methods employed in conducting the trials are fully detailed in Vol. II, Part VII, and this Part also contains a general discussion of the use of coal for steam raising, and a tabular summary of the whole series of trials.

Full notes of each of these trials are published in Vol. IV, Appendix II.

Producer Trials.

In the beginning, it was decided to attempt to carry out the boiler and producer tests on a rather small scale, owing to a wish to make the investigation of immediate value to the numerous small manufacturing and power plants which are springing up all over the country, especially in the west, where for many years they will play a leading part in its industrial development. It was also desired to test all coals with equal thoroughness, and as nearly as possible under identical conditions. The transportation of fifty odd 10 ton samples for distances ranging from 800 to 3,000 miles was a sufficiently serious matter. It was, therefore, decided to work on a scale of approximately 40 H.P., although it was known that bituminous coal producers had not been altogether perfected for so small an output. Assurances were given, however, by several of the leading firms making producers, that they could provide the necessary apparatus.

When, however, specifications were prepared and tenders asked for, the makers, both at home and abroad, exhibited an unexpected reluctance to guarantee their machinery, and much time was lost in correspondence. In the meanwhile an anthracite producer of approved form was put in; and a series of trial runs on anthracite, coke, etc., were commenced, to drill the staff, and get matters in working order. Ultimately, the makers of two well-known types of producers undertook to build plants for bituminous coal, and did actually erect producers with the necessary tar extraction apparatus; but in both cases the producers failed to meet the requirements originally specified, and were, therefore, removed.

The experience gained in the tests above mentioned enabled Professor Dudley to design a down-draught producer which did meet the requirements; and after a long series of preliminary tests, necessary to arrive at a trustworthy method of operation, it was possible to begin the final tests on the series of coal samples.

As in the boiler trials, the method of flying start was adopted: the actual runs lasting 24 hours, and the total operation almost 36 hours. This time occupied was as long as could be managed without a very large increase in the staff, and an even greater increase in the cost; but these 24 hour tests were checked by a sufficient number of longer trials—one lasting 10 days—to show that the apparatus was quite capable of doing continuous, *i.e.*, commercial work.

Criticism may be offered against the use of one producer for all classes of coal, from semi-anthracite to lignite; but in any series of tests it is undesirable to change the apparatus or the conditions of work more than is absolutely necessary. The results have justified the course taken in this case. It is scarcely necessary to say, that the scrubbers, washers, tar extractors, etc., were so fitted that they could be cut out by means of valves and by-passes, and that they were only used when necessary.

The methods employed in conducting the trials are fully set forth in Vol. II, Part VIII, and the results of the trials are presented in tabular form. This Part also contains a discussion of general questions of the use of producers and gas engines for the generation of power. The detailed results of the trials are contained in the present volume.

Chemical Work.

The chemical laboratory of the Mining Department at McGill University was given over exclusively to the work of the tests for more than three years. Standard methods of analysis were used as far as possible, and these, together with a number of important special methods, are fully described in Vol. II, Part IX. A summary statement of the analyses of all of the regular samples appears at the end of the same Part. Details of the less important analytic work, and accounts and records of a large amount of secondary work, are given in Vol. VI, Appendix V.

THE REPORT

It will be seen from the above description of the investigation, that an attempt has been made to cover a large field, and yet to do the work in great detail. As a result of this a very large amount of information has been gathered; but much of it is so highly technical as to be only of interest to specialists, hence it has been thought best to divide the Report—which comprises six volumes—into two main sections of two and four volumes respectively.

In the first section there are separate chapters, or parts, dealing with each of the seven divisions of the investigation outlined in the last few pages. Each of these parts begins with an introduction, in which the subject of the division is dealt with in a general way, followed by a more or less extended description and discussion of the experimental work attempted; and concluding with a carefully tabulated summary of all of the tests in that division.

Preceding the technical reports referred to above, there are two important chapters, the first being an introduction dealing with the investigation as a whole, and the second being a very full descriptive paper on the history, geology, and present commercial development of the coal fields and coal mines of Canada, from the pen of Mr. Théo. C. Denis—a member of the permanent staff of the Mines Branch of the Department of Mines. This part of the Report, which is profusely illustrated with maps and photographs, differs from the remainder in that its matter is largely drawn from previous publications of the Geological Survey and other sources, but it possesses great value as an introduction to the somewhat technical reports which follow, and is of importance, on its own account, as the most complete single work yet written on the coal fields of the Dominion.

The first two volumes of the Report, comprising Parts I to IX inclusive, may, therefore, be considered as complete in themselves, and it is hoped that they will prove of value, not only as contributions to the technological literature on coal, but also as a source of useful and timely information to the general public, on the coal resources of the Dominion and on the best methods of utilizing these resources.

The remaining four volumes, III, IV, V, and VI are given up exclusively to tabulated records and details of the tests summarized in Volumes I and II, to which they thus become highly technical appendices.

SYDNEY COAL FIELD

CAPE BRETON CO., NOVA SCOTIA

TRIAL OF No. 4 PRODUCER WITH COAL No. 36

Date—March 8 and 9, 1909. Trial Number—32

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29.83 inches.
" " 8.20 p.m., March 8	29.88 "
" " end of trial	29.97 "
Water meter reading at 9 a.m., March 8	96,877 imperial gallons.
" " " 8 a.m., " 9	99,765 " "
Difference, in 23 hours	2,888 " "
Brick in producer base	935 lbs
Average level of fuel below top plate of producer	18.3 inches.

Time.	
2.40 a.m., March 8	Started fire with 5 lbs. of shavings, 40 lbs. of wood, 120 lbs. of coke.
3.20 " " "	Down-draft, with fan exhausting directly to the atmosphere.
3.20 " " "	Charged 131 lbs. of coke.
4.30 " " "	" 120 " "
5.40 " " "	" 100 " "
7.00 " " "	" 100 " "
8.05 " " "	Down-draft with blower.
8.15 " " "	Started engine.
8.20 " " "	Trial commenced.
11.30 " " "	Gas washer blown through with steam.
4.00 p.m. " "	" " " "
5.20 " " "	Gas washer stopped owing to a hot bearing; sawdust scrubber being substituted.
6.20 " " "	
8.20 " " 9	Trial finished.

Engine valves in good condition at the end except for a little soot; the spindles were cleaned. Heavy suction in early morning due to dirt in long pipe.

Weight of wet refuse removed during trial	1,065 lbs.
A sample of 225 lbs. of this when dried weighed	147 "
Weight of wet refuse removed after the trial	1,073 "
A sample of 215 lbs. of this when dried weighed	133 "
Tar removed from the wet scrubber	84 "
Tar removed from the pipes, etc.	10 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 8 and 9, 1909. Trial Number—32.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m.	8·9	0·8	0·3	8·6	4·4	11·7	65·3	25·0
10.00 "	9·7	0·5	0·1	14·4	3·2	10·4	61·7	28·1
11.00 "	9·1	0·6	0·0	13·4	2·6	7·5	66·8	23·5
12.00 p.m.	10·0	0·5	0·2	8·4	4·2	9·8	66·9	22·6
1.00 "	10·0	0·3	0·0	13·9	2·5	4·1	69·2	20·5
2.00 "	10·9	0·4	0·1	10·0	3·2	7·6	67·8	20·9
3.00 "	12·3	0·2	0·2	10·4	3·3	14·4	59·2	28·3
4.00 "	12·9	0·3	0·0	11·6	2·0	14·4	58·8	28·0
5.00 "	13·7	0·2	0·0	10·4	2·9	12·2	60·6	25·5
6.30 "	10·6	0·7	0·0	13·3	2·7	11·8	60·9	28·8
8.00 "	10·7	0·5	0·2	12·7	3·1	9·8	63·0	25·8
9.30 "	10·3	0·6	0·0	15·1	2·5	9·8	61·9	27·2
10.50 "	8·8	0·6	0·4	11·2	4·4	16·0	58·6	32·0
12.30 a.m.	10·3	0·5	0·0	10·7	3·6	13·2	61·7	27·5
1.50 "	12·0	0·8	0·0	10·1	2·8	14·4	59·9	27·3
3.50 "	12·4	0·5	0·0	12·8	1·9	9·7	62·7	24·4
4.50 "	13·41	0·7	0·0	10·1	2·4	14·4	59·0	26·9
5.50 "	10·8	0·7	0·3	8·7	5·6	14·3	59·6	28·9
6.50 "	10·1	0·6	0·1	9·9	4·2	10·9	64·2	25·1

OBSERVATIONS OF GAS METER AND B. H. P.

Date—March 8 and 9, 1909. Trial Number—32.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.20 a.m.	2430300	....	N.B.O.	250	100	150	60961
8.50 "	2432190	1890	"	275	110	165	....
9.20 "	2433890	1700	"	275	110	165	....
9.50 "	2435710	1820	"	250	100	150	.....
10.20 "	2437355	1645	"	250	100	150	.....
10.50 "	2439080	1725	"	250	100	150	77700
11.20 "	2440990	1910	"	250	100	150	
11.50 "	2442130	1140	"	250	100	150	
12.20 p.m.	2443800	1670	"	250	100	150	
12.50 "	2445500	1700	"	250	100	150	
1.20 "	2447240	1740	"	250	100	150	
1.50 "	2448700	1460	"	250	100	150	
2.20 "	2450240	1540	"	250	100	150	
2.50 "	2451985	1745	"	250	100	150	
3.20 "	2453540	1555	"	250	100	150	
3.50 "	2455070	1530	"	250	100	150	
4.20 "	2456900	1830	"	250	100	150	
4.50 "	2458685	1785	"	250	95	155	
5.20 "	2460310	1625	"	250	95	155	
5.50 "	2462080	1770	"	250	95	155	
6.20 "	2463845	1765	"	250	95	155	
6.50 "	2465460	1615	"	250	95	155	
7.20 "	2467280	1820	"	275	108	167	
7.50 "	2468765	1485	"	275	108	167	
8.20 "	2470550	1785	"	250	95	155	
8.50 "	2472220	1670	"	250	95	155	
9.20 "	2473750	1530	"	250	95	155	
9.50 "	2475355	1605	"	250	95	155	
10.20 "	2477080	1725	"	250	95	155	
10.50 "	2478960	1880	"	250	95	155	
11.20 "	2480430	1470	"	250	95	155	
11.50 "	2482160	1730	"	250	95	155	
12.20 a.m.	2483740	1580	"	250	85	165	68030
12.50 "	2485540	1600	"	250	85	165	
1.20 "	2486790	1450	"	250	85	165	
1.50 "	2488500	1710	"	250	85	165	
2.20 "	2489950	1450	"	250	85	165	
2.50 "	2491550	1600	"	250	85	165	
3.20 "	2493220	1670	"	250	95	155	87940
3.50 "	2494980	1760	"	250	95	155	
4.20 "	2496760	1780	"	250	95	155	
5.20 "	2499900	3140	"	250	95	155	
5.50 "	2501500	1600	"	250	95	155	
6.20 "	2503200	1700	"	250	95	155	
6.50 "	2504660	1460	"	250	95	155	
7.20 "	2506240	1580	"	250	95	155	
7.50 "	2507910	1670	"	250	95	155	
8.20 "	2509540	1630	"	250	95	155	21060

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—March 8 and 9, 1909. **Trial Number—32.**

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.
			Inlet	Outlet		
8.20 a.m. ..	Regulating thermometers.					
8.50 “ ..	59	$\frac{5}{12}$	6·00	11·58	1810	96
9.20 “ ..	58	$\frac{5}{12}$	5·57	10·97	1880	96·5
9.50 “ ..	59	$\frac{5}{12}$	5·65	10·62	1930	91·3
10.20 “ ..	60	$\frac{1}{3}$	6·05	11·09	1710	102·9
10.50 “ ..	60	$\frac{1}{3}$	6·09	11·09	1770	105·2
11.20 “ ..	59	$\frac{1}{4}$	6·57	11·87	1600	134·7
11.50 “ ..	60	$\frac{5}{12}$	6·52	12·90	1790	108·7
12.20 p.m. ..	61	$\frac{1}{3}$	6·25	11·54	1600	100·5
12.50 “ ..	61	$\frac{1}{3}$	6·18	11·15	1713	101
1.20 “ ..	62	$\frac{1}{3}$	6·52	11·60	1910	115·4
1.50 “ ..	62	$\frac{1}{2}$	6·31	15·71	1650	102·8
2.20 “ ..	63	$\frac{5}{12}$	6·55	13·29	1830	117·1
2.50 “ ..	63	$\frac{5}{12}$	6·70	14·82	1770	136·5
3.20 “ ..	63	$\frac{5}{12}$	6·96	13·60	1730	109·1
3.50 “ ..	64	$\frac{5}{12}$	7·45	13·62	1870	106·9
4.20 “ ..	64	$\frac{1}{3}$	7·51	13·01	1600	104·5
4.50 “ ..	66	$\frac{1}{3}$	11·95	16·77	1770	101·2
5.20 “ ..	65	$\frac{1}{3}$	7·89	13·18	1770	111·1
5.50 “ ..	65	$\frac{1}{3}$	8·70	12·98	1870	95·2
6.20 “ ..	65	$\frac{1}{2}$	8·60	15·63	1735	96·6
6.50 “ ..	65	$\frac{1}{2}$	8·98	16·47	1750	104
7.20 “ ..	65	$\frac{1}{2}$	8·92	19·21	1725	140·5
7.50 “ ..	64	$\frac{5}{12}$	9·35	16·40	1600	107
8.20 “ ..	64	$\frac{5}{12}$	9·37	16·11	1790	114·6
8.50 “ ..	63	$\frac{7}{12}$	9·32	20·33	1830	136·8
9.20 “ ..	63	$\frac{1}{2}$	9·42	17·42	1660	105·2
9.50 “ ..	63	$\frac{1}{2}$	9·47	18·90	1695	127·1
10.20 “ ..	63	$\frac{1}{2}$	9·82	16·98	1690	95·8
10.50 “ ..	63	$\frac{1}{2}$	10·02	20·05	1625	129·0
11.20 “ ..	63	$\frac{1}{2}$	10·23	17·39	1755	98·7
11.50 “ ..	64	$\frac{1}{4}$	10·00	14·22	1780	130
12.20 a.m. ..	64	$\frac{5}{12}$	7·59	16·70	1600	138·1
12.50 “ ..	63	$\frac{5}{12}$	7·29	14·01	1610	102·9
1.20 “ ..	63	$\frac{5}{12}$	7·02	13·67	1660	105
1.50 “ ..	63	$\frac{5}{12}$	7·09	14·81	1650	121
2.20 “ ..	63	$\frac{5}{12}$	7·05	14·74	1620	118·4
2.50 “ ..	63	$\frac{5}{12}$	6·27	14·07	1640	121·5
3.20 “ ..	64	$\frac{5}{12}$	7·48	14·74	1670	115·3
3.50 “ ..	64	$\frac{5}{12}$	7·31	12·85	1800	94·5
4.20 “ ..	63	$\frac{5}{12}$	7·20	12·88	1900	102·5
4.50 “ ..	62	$\frac{5}{12}$	6·71	13·36	1950	123
5.50 “ ..	63	$\frac{1}{3}$	7·15	14·56	1600	141
6.20 “ ..	63	$\frac{1}{3}$	6·47	12·95	1640	106·5
6.50 “ ..	63	$\frac{1}{3}$	6·99	12·75	1640	115·7
7.20 “ ..	63	$\frac{5}{12}$	7·00	14·06	1850	124·0
7.50 “ ..	63	$\frac{5}{12}$	7·10	13·80	1840	117·0

Time	Coal Charged.	Total Coal.	Time of Poking.
	lbs.	lbs.	
8.20 a.m.	50	50	8.20 a.m.
8.50 “	25	75	8.50 “
9.20 “	25	100	9.20 “
9.40 “	25	125	9.40 “
9.55 “	25	150	9.55 “
10.20 “	25	175	......
10.50 “	25	200	10.50 “
11.05 “	25	225	......
11.15 “	50	275	11.15 “
11.35 “	25	300	11.55 “
12.05 p.m.	25	325	12.05 p.m.
12.45 “	25	350	12.45 “
1.15 “	50	400	1.05 “
1.45 “	25	425	1.45 “
2.10 “	25	450	......
2.45 “	75	525	2.40 “
3.50 “	50	575	3.50 “
5.05 “	75	650	4.50 “
6.05 “	50	700	5.05 “
7.10 “	50	750	7.10 “
8.10 “	50	800	......
8.40 “	75	875	8.30 “
9.40 “	50	925	......
10.50 “	50	975	10.50 “
11.40 “	50	1025	11.40 “
12.15 a.m.	50	1075	......
12.55 “	50	1125	12.55 a.m.
1.25 “	50	1175	......
2.00 “	50	1225	2.10 “
3.50 “	50	1275	......
4.40 “	50	1325	4.40 “
5.40 “	50	1375	5.40 “
6.25 “	50	1425	6.25 “
7.20 “	25	1450	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—March 8 and 9, 1909. Trial Number—32.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.20 a.m.	820	64	60	103	3·7	7·2	7·4	9·2	2·0	1·2	74	70
8.50 “	870	65	59	143	3·6	7·0	7·2	10·5	2·7	1·2	73	69
9.20 “	810	65	58	141	3·4	5·7	5·9	7·6	2·5	0·9	70	66
9.50 “	860	65	61	140	3·7	6·6	6·8	11·0	3·8	2·5	74	70
10.20 “	760	66	62	138	3·4	5·3	5·5	7·0	2·2	0·7	72	68
10.50 “	780	66	62	136	3·5	5·8	6·0	8·8	2·8	1·4	74	70
11.20 “	810	66	62	140	3·0	5·7	5·9	7·8	1·8	0·5	57	53
11.50 “	780	66	61	137	3·1	5·7	5·9	7·8	3·0	1·7	75	72
12.20 p.m.	820	70	64	128	3·7	6·6	6·8	10·3	3·4	1·8	72	68
12.50 “	840	70	64	127	3·6	6·3	6·5	10·7	4·0	2·4	70	66
1.20 “	800	69	65	128	3·4	5·5	5·7	7·8	2·3	[illegible]	70	67
1.50 “	770	68	62	140	3·1	4·6	4·8	7·5	2·8	1·1	70	66
2.20 “	850	67	63	140	3·4	6·4	6·8	9·5	2·8	1·0	74	71
2.50 “	880	64	65	139	3·4	6·3	6·5	9·6	2·7	0·9	74	70
3.20 “	850	67	65	145	3·2	5·4	5·6	8·0	2·4	0·8	73	69
3.50 “	850	67	67	138	3·6	6·4	6·6	10·4	2·9	1·0	73	68
4.20 “	860	67	66	140	3·6	6·5	6·7	11·1	2·8	1·0	71	69
4.50 “	830	68	70	138	3·3	5·3	5·5	7·4	2·4	0·8	65	60
5.20 “	880	71	67	139	3·5	6·2	6·4	9·8	3·0	1·1	68	64
5.50 “	850	71	67	138	3·4	6·1	6·3	8·5	2·6	0·8	69	65
6.20 “	820	70	66	139	3·3	5·3	5·5	8·7	2·7	0·9	70	66
6.50 “	820	68	65	143	3·5	6·0	6·2	8·8	2·7	1·0	54	50
7.20 “	850	66	64	141	3·6	6·4	6·6	7·6	2·4	0·8	42	38
7.50 “	860	66	64	140	3·6	6·7	6·9	9·6	3·0	1·0	78	74
8.20 “	810	64	63	152	3·4	5·4	5·6	9·2	2·8	0·9	56	61
8.50 “	800	63	63	141	3·1	5·7	5·9	7·2	2·2	0·6	54	50
9.20 “	820	63	63	136	3·6	6·6	6·8	9·5	3·0	1·0	55	51
9.50 “	780	62	63	132	3·0	5·5	5·7	8·0	2·2	0·5	50	45
10.20 “	820	62	64	132	3·4	6·1	6·3	9·4	2·9	[illegible]	52	48
10.50 “	850	62	65	133	3·6	6·6	6·8	8·5	2·4	0·6	52	48
11.20 “	840	63	65	130	3·6	6·6	6·8	9·9	3·0	1·1	50	46
11.50 “	800	64	65	135	3·0	5·0	5·2	7·8	2·3	0·8	61	57
12.20 a.m.	830	64	64	132	3·2	5·3	5·5	9·5	2·5	2·0	55	52
12.50 “	800	65	64	132	3·3	5·3	5·5	10·0	2·8	0·7	44	40
1.20 “	740	65	63	133	3·1	5·1	5·3	10·2	3·0	0·8	60	57
1.50 “	800	65	64	132	3·1	4·8	5·0	7·8	2·4	0·6	50	47
2.20 “	860	66	65	129	3·3	5·3	5·5	7·8	2·5	0·5	60	56
2.50 “	840	66	65	130	3·2	5·7	5·9	7·0	2·3	0·5	58	55
3.20 “	840	66	65	132	3·3	5·4	5·6	8·7	2·8	0·7	65	62
3.50 “	840	67	66	131	3·4	6·0	6·1	9·4	2·8	0·8	64	61
4.20 “	857	67	65	132	3·4	6·0	6·1	9·4	2·9	0·7	55	52
4.50 “	860	66	64	128	3·5	6·1	6·3	9·7	3·0	0·9	51	48
5.20 “	870	66	64	132	3·2	5·8	6·0	9·5	2·9	0·7	50	47
5.50 “	880	66	64	130	3·3	6·0	6·2	9·4	2·8	0·7	54	50
6.20 “	820	66	64	132	3·4	6·4	6·6	11·0	3·1	0·9	61	58
6.50 “	780	66	64	135	3·2	5·5	5·7	10·0	3·0	1·0	63	60
7.20 “	840	66	62	134	3·3	5·5	5·7	12·5	3·1	0·9	59	55
7.50 “	860	66	62	131	3·2	5·4	5·5	11·6	3·4	1·2	48	45
8.20 “	840	66	63	133	3·4	5·6	5·8	10·9	3·2	0·7	60	57

PRODUCER TRIAL No. 32.

Date—March 8-9, 1909. Producer No. 4, at McGill University.
Time of lighting up—2.40 a.m. Trial commenced 8.20 a.m. March 8; ended 8.20 a.m. March 9.
Duration of trial—24 hours. Kind of fuel—No. 36 coal.
Observers and staff during trial—Cameron, Killam, Gardner.
Computers—Blizard, Cameron, Killam.
Chemists—Stansfield, Nicolls, Campbell.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1450
2.	Moisture in coal as charged	per cent.	2·4
3.	Calorific value of coal as charged, per lb.	B.T.U.	13520
4.	" " of dry coal per lb.	B.T.U.	13860
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 57·6; volatile matter, 35·0; ash, 5; moisture, 2·4	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 38·1; volatile matter, 4·7 Total	per cent.	42·8
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	42·8

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	79240
9.	Average temperature of gas leaving producer	°F.	783
10.	" " " at meter	°F.	66
11.	Average temperature of air in producer house	°F.	64
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	112·8
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	115·7
13a.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	106·5
14.	Average barometric pressure	lbs. sq. in	14·65
15.	" suction at producer	ins. of water	0·98
16.	" suction at exhauster	ins. of water	9·1
17.	" pressure of gas at meter	ins. of water	4·62

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2160
19.	" water used in scrubber and gas washer	lbs.	35910
20.	" tar extracted in scrubber and gas washer	lbs.	94
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		320198
24.	Average explosions per minute		101·2
25.	Average effective load on brake	lbs.	155·5
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	69·6

28. **Notes.**

Fire poked at 8.20, 8.50, 9.20, 9.40, 9.55, 10.60, 11.15, 11.55 a.m.; 12.05, 12.45, 1.05, 1.45, 2.40, 3.50, 4.50, 5.05, 7.10, 8.30, 10.50, 11.40 p.m.; 2.10, 4.40, 5.40, 6.25 a.m.
Refuse removed at : 8.50, 9.55 a.m.; 12.45, 2.45, 5.25, 8.30 p.m.; 2.30, 3.50, 5.40 a.m.
Behaviour of coal : Required considerable attention, and cakes
Average time between poking : One hour.
Clinker : No record of special difficulty, from clinker.
Tar : Fair amount of tar.
State of engine valves at end of trial : Good condition, except for a little soot.
Valves last cleaned : Feb. 23. 1909.

29. ANALYSIS OF DRY COAL.

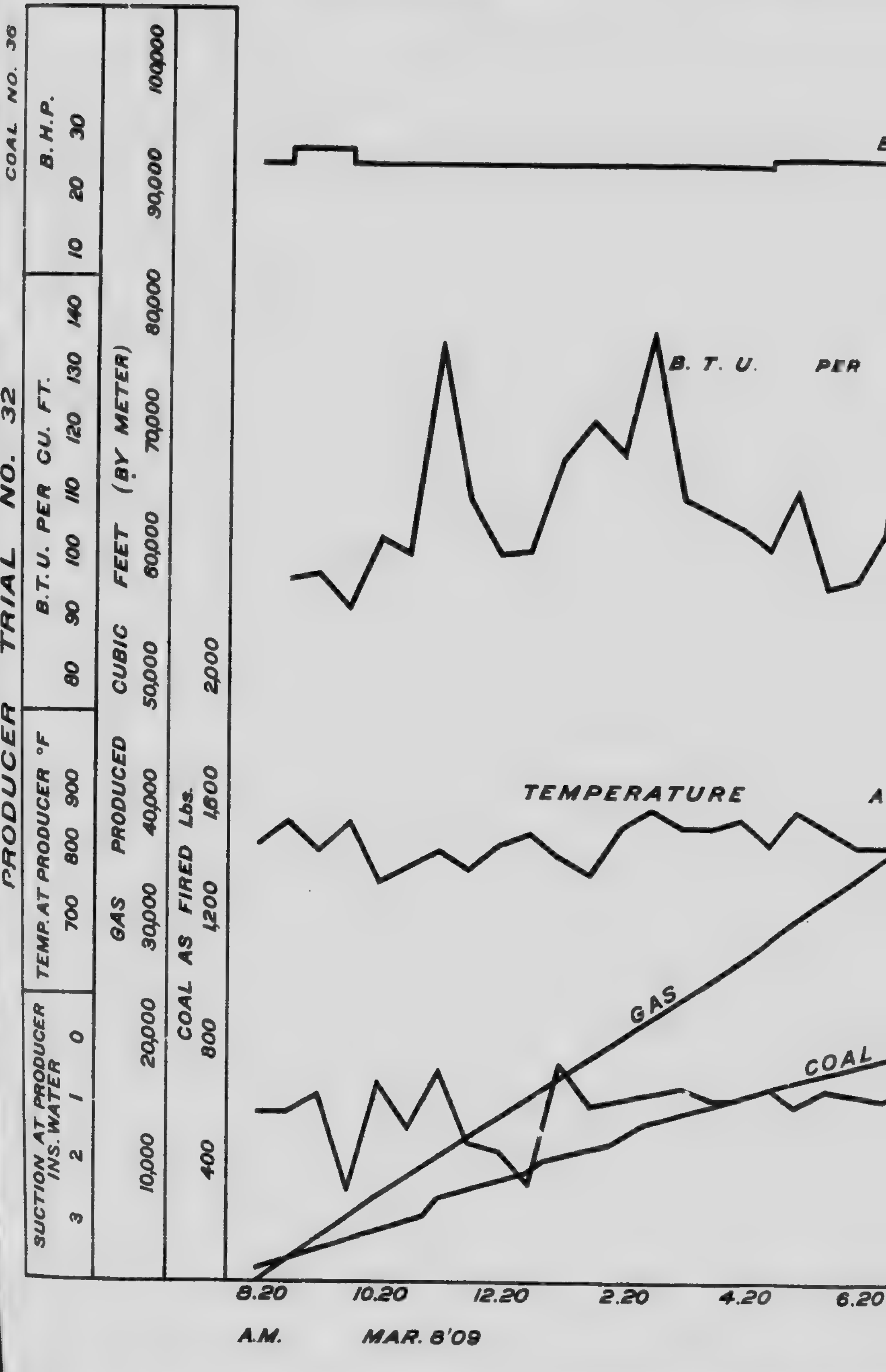
Hydrogen	5·0
Carbon	76·7
Nitrogen	1·6
Oxygen	8·4
Sulphur	2·4
Total carbon contained by dry coal charged	1085 lbs.

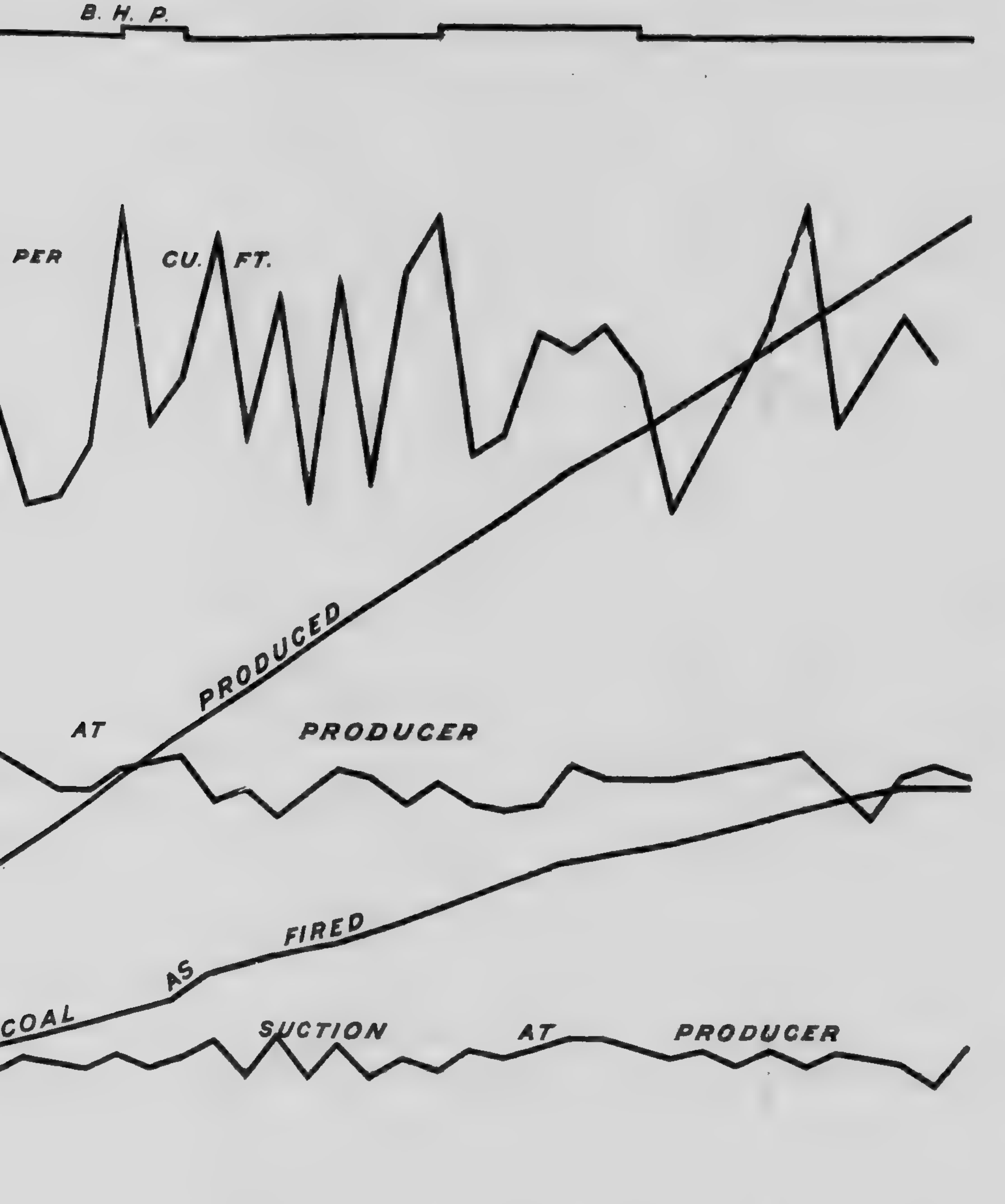
30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	10·4
Oxygen	0·5
Carbon monoxide	11·4
Hydrogen	11·1
Methane	3·2
Ethylene	0·1
Nitrogen	62·5
	100·0

PRODUCER TRIAL NO. 32

COAL NO. 38


PRODUCER TRIAL NO. 32
COAL NO. 36
SUCTION AT PRODUCER INS. WATER
3 2 1 0
TEMP. AT PRODUCER °F
700 800 900
B.T.U. PER CU. FT.
80 90 100 110 120 130 140
B.H.P.
10 20 30
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600 2,000
B
B. T. U. PER
TEMPERATURE A
GAS
COAL
8.20 10.20 12.20 2.20 4.20 6.20
A.M. MAR. 8'09



APPENDIX III VOL.V

1.
2.
3.
4.
5.

6.

7.

8.
9.
10.
11.
12a. A

12b. A

13a. A

14. A
15.
16.
17.

18. T
19.
20.
21. A
22.

23. T
24. A
25. A
26. Ef
27. A

28.

4.5

29.

Remarks.

A satisfactory trial considering the nature of the coal. A deep fuel bed was maintained which destroyed a good deal of the tar. Refuse seemed to contain a large proportion of combustible. This coal gives some trouble in the producer, but the gas was uniform enough to avoid any engine trouble.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1415
32	Combustible charged during trial	lbs.	1343
33.	Average B.H.P. of engine during trial	H.P.	25·2
34.	“ indicated H.P. of engine during trial	H.P.	40·3
35.	“ H.P. taken by exhauster and gas washer	H.P	4·0
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	25·2
37.	“ “ “ corresponding to total gas produced	H.P.	25·2
38.	“ “ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	21·2

Hourly Quantities.

39.	Coal charged per hour	lbs.	60·4
40.	Dry coal charged per hour	lbs.	59·0
41.	Combustible charged per hour	lbs.	55·9
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	15·1
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	14·7
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	14·0
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	9·6
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·1
47.	Gas (by meter) supplied by producer per hour	cub. ft	3302
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft	3220
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken.	cub. ft.	3302
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3220
51.	Calorific value of coal charged per hour	B.T.U.	817000
52.	“ “ gas produced per hour (lower value)	B.T.U.	342930
53.	Steam used in producer per hour	lbs.	90·1

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	53·3
55.	Gas (dry at 60° and 14·7 lbs.per sq. in.) produced dry coal charged	cub. ft.	54·6
56.	Gas (dry at 60° and 14·7 lbs.per sq. in.) produced per lb. of combustible charged	cub. ft.	57·6
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I. H.P. per hr.	cub. ft.	79·9
58.	“ “ “ “ “ “ B.H.P. “	cub. ft	127·7
59.	Steam used in producer per lb. coal charged	lbs.	1·49
60.	Water used in scrubber and gas washer per lb. coal charged	lbs	24·77
61.	Water used in scrubber and gas washer per 1000 cub. ft gas produced	lbs.	153·5
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	42·0
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	35·0
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	30·0
65.	Thermal efficiency of engine, based on B.H.P.	per cent.	18·7
66.	Over all efficiency of producer and engine plant	per cent.	7·8
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13,690
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	32,450

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·40	2·34	2·22
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·85	2·78	2·64
71	Pounds per hour charged into producer per B. H.P., allowing for power and also for steam used by producer	3·37	3·29	3·12

TRIAL OF No. 4 PRODUCER WITH COAL No. 35

Date—March 4 and 5, 1909.

Trial Number—31.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·29 inches.
" " 8.20 p.m., March 4	29·02 "
" " end of trial	29·10 "
Water meter reading at 8.35 a.m., March 4	93,943 imperial gallons
" " " 7.35 a.m., " 5	96,578 " "
Difference in 23 hours	2,635 " "
Brick in producer base	716 lbs
Average level of fuel below the top plate of the producer	20 inches.

TIME			
2.45 a.m.,	March	4	Started fire with 10 lbs. of shavings, 40 lbs. of wood, 141 lbs. of coke
4.00 "	"	"	Down-draft with fan exhausting directly to the atmosphere.
4.15 "	"	"	Charged 70 lbs. of coke.
5.00 "	"	"	" 92 "
8.10 "	"	"	Down-draft with blower.
8.15 "	"	"	Started engine.
8.15 "	"	"	Charged 125 lbs. of coal.
8.20 "	"	"	Started trial.
2.15 p.m.,	"	"	Gas washer blown through with steam.
5.30 "	"	"	" " "
8.10 "	"	"	" " "
10.45 "	"	"	" " "
12.50 a.m.,	"	5	" " "
3.30 "	"	"	" " "
6.20 p.m.,	"	4	Stopped blower to clean out pipe between the gas-washer and scrubber; the engine was kept running on the supply of gas in the holder.
6.30 "	"	"	The blower was restarted.
8.20 "	"	"	No load on engine, pipes blown out with steam.
8.30 "	"	"	
8.40 "	"	"	Cover removed from bottom of wet scrubber and elbow blown out with steam.
8.50 "	"	"	
9.45 "	"	"	Plant working better, no sign of tar on valves.
8.20 a.m.,	"	5	Finished trial. Pipes found to be dirty at the end of the run.

Tar removed from the wet scrubber after the trial	125 lbs.
Tar removed from the gas washer after the trial	5 "
Tar removed from the pipes after the trial	18 "
Wet refuse removed from the producer after the trial	1,141 lbs
A sample of 230 lbs. of this when dried, weighed	138 "
Wet refuse removed from the producer during the trial	430 "
A sample of 215 lbs. of this refuse when dried, weighed	144 "

As there was not enough brick, 300 lbs. of refuse was added to build up the producer fuel base before commencing trial.

The valves were examined at the end, and found to be so good as not to require cleaning

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 4 and 5, 1909. Trial Number—31.

Note: R. and B. apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent	per cent.	per cent.	per cent.
9.00 a.m....	12·2	0·4	0·0	12·2	3·0	11·3	60·9	26·5
10.05 "	12·8	0·4	0·0	11·1	2·9	10·2	62·6	24·2
11 00 "	9·8	0·4	0·4	8·6	5·1	10·4	65·3	24·5
12.00 p.m....	9·4	0·2	0·6	7·2	7·3	10·1	65·2	25·2
1.00 "	11·7	0·2	0·0	12·5	2·8	11·3	61·5	26·6
2.00 "	9·8	0·3	0·1	15·1	2·4	10·3	62·0	27·9
3.00 "	9·9	0·4	0·1	14·7	2·3	10·5	62·0	27·7
4.00 "	9·9	0·4	0·5	7·7	5·5	13·1	62·0	26·8
5.00 "	10·6	0·4	0·4	8·1	4·6	10·4	65·5	23·5
7.00 "	9·2	0·7	0·3	9·0	5·0	11·6	65·2	25·9
8.00 "	11·0	0·3	0·1	9·9	3·7	5·5	69·5	19·2
9 40 "	8·1	0·4	0·1	17·4	2·6	6·7	74·7	26·8
10.50 "	8·7	0·6	0·2	11·8	3·7	11·4	63·6	27·1
12.20 a.m....	9·1	0·4	0·1	13·1	3·3	8·5	65·5	25·0
1.50 "	9·1	0·3	0·1	12·2	3·7	11·4	63·2	27·4
3.20 "	11·6	0·5	0·3	11·4	3·5	17·1	55·6	32·3
4.50 "	10·2	0·6	0·2	9·5	3·6	13·1	62·8	26·4
6.20 "	7·1	0·4	0·0	20·3	1·8	5·4	65·0	27·5

OBSERVATIONS OF GAS METER AND B. H. P.

Date—March 4 and 5, 1909.

Trial Number—31.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.20 a.m.	2351830	....	N.B.O.	275	102	173	99470
8.50 "	2353700	1870	"	275	102	173	......
9.20 "	2355560	1860	"	275	110	165	06160
9.50 "	2357520	1960	"	275	110	165	
10.20 "	2359120	1600	"	275	110	165	
10.50 "	2360980	1860	"	275	110	165	
11.20 "	2362680	1700	"	275	110	165	
11.50 "	2364180	1500	"	275	110	165	
12.20 p.m.	2365780	1600	"	275	110	165	
12.50 "	2367530	1750	"	275	110	165	
1.20 "	2369320	1790	"	275	110	165	
1.50 "	2371100	1780	"	275	110	165	
2.20 "	2372690	1590	"	275	110	165	
2.50 "	2374680	1990	"	275	110	165	
3.20 "	2376470	1740	"	275	105	170	
3.50 "	2378190	1720	"	275	105	170	49670
4.20 "	2379430	1240	"	275	105	170	
4.50 "	2381190	1760	"	275	105	170	
5.20 "	2382640	1450	"	250	90	160	
5.50 "	2384260	1620	"	250	90	160	59600
6.20 "	....	....	....	0	0	....	
7.20 "	2388180	3920	"	250	90	160	
7.50 "	2389580	1400	"	250	90	160	
9.00 "	2392560	2980	"	250	90	160	79200
9.50 "	2395260	2700	"	250	90	160	
10.20 "	2397050	1790	"	250	90	160	
10.50 "	2398830	1780	"	250	90	160	
11.20 "	2400240	1410	"	250	90	160	
11.50 "	2401900	1660	"	250	95	155	
12.20 a.m.	2403420	1520	"	250	95	155	03340
12.50 "	2405180	1760	"	250	95	155	
1.20 "	2406890	1710	"	250	95	155	
1.50 "	2408330	1440	"	250	95	155	
2.20 "	2409850	1520	"	250	95	155	
2.50 "	2411310	1460	"	250	95	155	
3.20 "	2412820	1510	"	250	90	160	
3.50 "	2414280	1460	"	250	90	160	
4.20 "	2416100	1820	"	250	90	160	
4.50 "	2417660	1560	"	250	90	160	
5.20 "	2419150	1490	"	250	90	160	
5.50 "	2420935	1785	"	250	90	160	
6.20 "	2422580	1645	"	250	90	160	
6.50 "	2424260	1680	"	250	90	160	
7.20 "	2425850	1590	"	250	90	160	
7.50 "	2427590	1740	"	250	90	160	
8.20 "	2429360	1770	"	250	90	160	60010

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED

Date—March 4 and 5, 1909. Trial Number—31.

Note.—Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp Deg. Cent. Inlet	Water Temp Deg. Cent. Outlet	Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged. lbs.	Total Coal. lbs.	Time of Poking.
8 20 a.m.							8 20 a.m.			
8 50 "	54	$\frac{7}{12}$	4·31	11·83	1650	84·3	9 40 "	75	75	
9 20 "	54	$\frac{7}{12}$	4·12	12·09	1610	87·2	10 30 "	50	125	
9 50 "	53	$\frac{7}{12}$	3·93	11·51	1783	91·9	11 55 "	75	200	11 00 a.m.
10 20 "	53	$\frac{1}{2}$	3·99	10·62	1740	91·4	1 10 p.m.	50	250	11.50 "
10 50 "	53	$\frac{5}{12}$	4·14	9·85	1900	104·0	1 40 "	50	300	1 20 p m
11 20 "	54	$\frac{5}{12}$	4·46	10·81	1870	113·0	2 20 "	50	350	
11 50 "	55	$\frac{1}{3}$	4·66	10·84	1600	117·6	3 30 "	75	425	2 20 "
12 20 p.m.	58	$\frac{5}{12}$	5·69	10·73	1875	89·9	3 50 "	50	475	3.50 "
12 50 "	60	$\frac{1}{2}$	6·03	13·36	1685	97·8	4.30 "	50	525	
1 20 "	60	$\frac{1}{2}$	6·21	13·67	1810	107·0	5 15 "	50	575	4 25 "
1 50 "	60	$\frac{1}{2}$	5·33	13·00	1830	111·3	5.50 "	50	625	4.55 "
2 20 "	61	$\frac{1}{2}$	5·69	12·73	1850	103·3	6 35 "	50	675	5 15 "
2 50 "	63	$\frac{5}{12}$	6·01	12·64	1675	105·6	7.05 "	25	700	5 50 "
3 20 "	62	$\frac{1}{2}$	5·31	12·90	1810	108·8	7 40 "	25	725	
3 50 "	63	$\frac{1}{2}$	5·36	15·36	1715	135·0	8 05 "	50	775	6 50 "
4 20	64	$\frac{1}{2}$	5·67	13·92	1760	115·0	9 05 "	25	800	6 55 "
4 50 "	64	$\frac{7}{12}$	5·40	16·88	1755	137·0	9 15 "	25	825	7 15 "
5 20 "	64	$\frac{1}{2}$	5·94	14·13	1795	116·4	10.15 "	25	850	7 40 "
5 50 "	64	$\frac{5}{12}$	5·22	11·81	1800	112·8	10 50 "	50	900	7 50 "
6 20 "	64						11 20 "	50	950	9 05 "
6 50 "	64	$\frac{7}{12}$	6·05	15·32	1730	110·1	12 15 a.m.	25	975	10 05 "
7 20 "	65	$\frac{1}{2}$	6·79	16·40	1600	121·8	1.15 "	25	1000	10 50 "
7 50 "	65	$\frac{1}{2}$	7·05	16·14	1600	115·2	1.40 "	25	1025	11.00 "
9 10 "	67	$\frac{1}{2}$	6·41	15·38	1730	123	2 00 "	50	1075	11 30 "
9 50 "	67	$\frac{1}{2}$	6·74	14·70	1600	101	2 45 "	50	1125	2.00 a.m.
10 20 "	68	$\frac{1}{2}$	6·86	14·69	1810	103·6	3 20 "	25	1150	2 50 "
10 50 "	67	$\frac{1}{4}$	8·40	13·03	1600	117·5	4 00 "	50	1200	3 20 "
11 20 "	67	$\frac{1}{3}$	7·08	11·92	1700	97·5	4 50 "	50	1250	4.00 "
11 50 "	68	$\frac{5}{12}$	6·64	13·98	1885	131·4	5.10 "	50	1300	4 30 "
12 20 a.m.	67	$\frac{5}{12}$	6·93	12·94	1890	108	5 50 "	25	1325	4 50 "
12 50 "	68	$\frac{5}{12}$	9·52	15·10	1940	103	6 40 "	25	1350	
1 20 "	68	$\frac{1}{2}$	8·54	17·73	1690	123	7 00 "	25	1375	
1 50 "	68	$\frac{5}{12}$	7·24	13·84	1660	104·3	7.15 "	25	1400	7 00 "
2 20 "	68	$\frac{5}{12}$	7·27	15·97	1690	139·8				
2 50 "	68	$\frac{5}{12}$	7·30	14·41	1770	119·6				
3 20 "	68	$\frac{2}{3}$	7·28	20·14	1740	132·8				
3 50 "	68	$\frac{7}{12}$	8·94	17·50	1680	97·6				
4 20 "	68	$\frac{1}{2}$	7·33	16·35	1655	118·4				
4 50 "	68	$\frac{5}{12}$	6·74	15·68	1760	118·7				
5 20 "	67	$\frac{1}{2}$	6·44	15·08	1685	115·3				
5 50 "	67	$\frac{5}{12}$	6·35	13·93	1710	123·0				
6 20 "	66	$\frac{1}{2}$	6·17	14·35	1610	104·5				
6 50 "	65	$\frac{1}{2}$	6·94	13·00	1785	98·2				
7 20 "	64	$\frac{1}{2}$	5·95	13·04	1860	104·5				
7 50 "	63	$\frac{5}{12}$	5·94	11·75	1650	90·8				
8 20 "										

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

-March 4 and 5, 1909.

Trial Number—31.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.20 a.m.	620	54	55	83	3·6	6·4	8·5	8·0	1·7	0·8	39	32
8.50 "	790	56	56	136	3·3	5·7	6·9	6·4	2·8	0·6	56	50
9.20 "	820	56	56	136	3·6	6·4	8·3	7·8	2·5	0·6	63	59
9.50 "	840	57	55	133	3·5	5·3	6·8	6·3	3·0	1·0	60	56
10.20 "	840	57	55	128	3·5	6·2	8·2	8·0	2·5	0·9	61	58
10.50 "	820	57	55	135	3·4	5·8	8·5	2·6	2·6	1·3	69	65
11.20 "	800	58	56	140	3·2	5·2	7·6	6·7	3·0	0·7	54	51
11.50 "	800	59	57	141	3·1	5·1	9·0	8·7	3·3	1·1	54	51
12.20 p.m.	820	62	64	142	3·2	6·0	8·5	8·1	2·2	1·3	60	54
12.50 "	820	64	67	144	3·4	6·3	9·0	8·7	3·2	1·0	72	68
1.20 "	810	67	67	158	3·3	6·2	8·3	8·0	2·8	1·0	74	70
1.50 "	800	67	64	128	3·3	6·2	8·8	8·3	3·0	1·0	73	71
2.20 "	780	66	65	127	3·3	6·2	8·6	8·3	2·7	1·0	73	70
2.50 "	820	66	67	154	3·6	6·5	8·0	7·5	3·0	1·1	62	60
3.20 "	820	70	66	145	3·5	6·2	8·5	8·2	3·3	1·6	57	55
3.50 "	880	69	67	150	3·4	6·2	9·1	8·8	3·0	0·7	58	55
4.20 "	740	68	68	148	3·1	5·0	8·4	8·0	3·7	1·4	61	59
4.50 "	800	68	66	139	3·1	5·6	10·5	9·9	4·3	1·2	70	68
5.20 "	800	68	66	143	3·4	6·3	9·5	—	4·0	1·5	61	58
5.50 "	800	70	64	136	3·2	6·3	9·0	8·6	3·7	1·3	67	63
6.45 "	760	70	66	118	3·2	6·0	9·8	9·4	3·5	2·6	40	37
7.20 "	760	70	68	133	3·0	5·8	8·1	7·6	2·7	1·8	68	64
7.50 "	770	70	69	130	3·3	6·0	10·4	10·0	4·0	3·0	60	57
9.00 "	840	73	70	108	3·4	6·4	9·1	8·7	3·8	3·3	63	60
9.50 "	860	72	70	128	3·6	6·5	9·4	9·0	3·0	1·9	50	47
10.20 "	850	70	70	130	3·3	6·5	9·0	8·4	2·9	1·5	55	51
10.50 "	920	70	70	130	3·9	7·0	7·2	9·1	3·7	2·3	50	47
11.20 "	840	74	70	132	3·2	6·2	6·9	8·7	3·7	1·5	54	50
11.50 "	890	74	69	129	3·3	6·3	6·5	10·3	4·1	3·0	56	53
12.20 a.m.	850	73	70	128	3·3	5·6	5·8	10·0	4·1	3·2	68	64
12.50 "	900	72	70	128	3·8	7·2	7·4	9·3	3·6	1·6	49	45
1.20 "	860	74	73	130	3·3	5·8	6·0	8·0	2·8	1·6	54	51
1.50 "	850	76	71	128	3·4	5·8	6·0	9·4	3·2	1·7	63	59
2.20 "	840	74	70	128	3·2	5·9	6·1	8·7	3·3	1·8	54	50
2.50 "	810	72	70	130	3·2	5·3	5·5	9·9	3·3	2·0	60	56
3.20 "	810	71	70	128	3·3	5·4	5·6	9·8	3·0	1·0	52	48
3.50 "	860	71	71	128	3·9	5·7	5·9	9·2	3·9	2·3	[illegible]	50
4.20 "	870	74	70	129	3·3	6·2	6·4	9·7	3·4	1·9	64	60
4.50 "	840	73	68	125	3·3	6·2	6·4	9·6	3·3	1·5	59	55
5.20 "	800	70	67	128	3·1	5·5	5·7	9·8	4·0	2·3	50	46
5.50 "	850	68	66	131	3·4	6·1	6·3	10·1	3·7	2·0	62	58
6.20 "	840	67	65	128	3·5	7·0	7·2	11·0	3·5	1·8	78	75
6.50 "	840	66	63	130	3·5	6·4	6·6	11·4	3·9	2·6	77	74
7.20 "	850	64	63	130	3·4	6·5	6·7	12·0	4·1	2·2	58	55
7.50 "	870	64	62	120	3·4	6·7	6·9	12·6	4·1	2·0	45	41
8.20 "	890	64	62	122	3·8	7·8	8·0	13·7	3·4	1·5	58	55

PRODUCER TRIAL No. 31.

Date—March 4-5, 1909. Producer No. 4, at McGill University.

Time of lighting up—2.45 a.m. Trial commenced 8.20 a.m. March 4; ended 8.20 a.m. March 5.

Duration of trial—24 hours. Kind of fuel—No. 35 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Killam, Cameron.

Chemists—Stansfield, Campbell, Nicolls

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1400
2.	Moisture in coal as charged	per cent.	1·4
3.	Calorific value of coal as charged, per lb	B.T.U.	13800
4.	" " of dry coal per lb	B.T.U.	14000
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 52·6; volatile matter, 35·1; ash, 10·9; moisture, 1·4	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 64·1; volatile matter, 4·4	Total per cent.	68·5
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	40

GAS.

8.	Total gas produced during trial (from meter readings)	cub ft.	77530
9.	Average temperature of gas leaving producer	°F.	785
10.	" " " at meter	°F.	67
11.	Average temperature of air in producer house	°F.	65
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U	110·3
12b	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	116·4
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	107·3
14.	Average barometric pressure	lbs. sq in.	14·28
15.	" suction at producer	ins. of water	1·6
16	" suction at exhauster	ins. of water	9·3
17.	" pressure of gas at meter	ins. of water	4·73

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2160
19.	" water used in scrubber and gas washer	lbs.	33260
20.	" tar extracted in scrubber and gas washer	lbs.	148
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		321080
24.	Average explosions per minute		103·1
25.	Average effective load on brake	lbs.	161·75
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	70·1

28. **Notes.**

Fire poked at : 11.00, 11.50 a.m.; 1 20, 2.20, 3.50, 4 25, 4.55, 5.15, 5.50, 6.50, 6 55, 7.15, 7 40, 7.50, 9.05, 10.50, 11.00, 11.30 p.m.; 2.00, 2.50, 3.20, 4.00, 4.30, 4.50, 7.00.

Refuse removed at: 11.50 a.m.; 2.20 5.15, 6 15, 6.50, 7.15, 8.00, 9.05, 10.50, 11 00, 11.30 p.m.; 1 30, 2 50, 4.50, 5.00, 7.00.

Behaviour of coal: Cakes; fire required a lot of attention.

Average time between poking: 35 minutes.

Clinker: Tendency to arch across top.

Tar: Troublesome.

State of engine valves at end of trial: Did not need cleaning.

Valves last cleaned: Feb. 23, 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	5·2%
Carbon	77·0%
Nitrogen	.....
Oxygen	.....
Sulphur	3·7%
Total carbon contained by dry coal charged	1063·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	10·0%
Oxygen	0·4%
Carbon monoxide	11·8%
Hydrogen	10·5%
Methane	3·7%
Ethylene	0·2%
Nitrogen	63·4%

REMARKS.

This coal is not very satisfactory for producer work, on account of large amounts of dirt and tar in it; coal caking on top of fire causing high suction.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1380
32.	Combustible charged during trial	lbs.	1228
33.	Average B.H.P. of engine during trial	H.P.	26·33
34.	" indicated H.P. of engine during trial	H.P.	41·35
35.	" H.P. taken by exhauster and gas washer	H.P.	4·0
36.	" B.H.P. while gas consumption of engine was taken	H.P	26·33
37.	" " corresponding to total gas produced	H.P.	26·33
38.	" " " " " " and available for outside use, allowing for power used	H.P.	22·33

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	58·3
40.	Dry coal charged per hour	lbs.	57·5
41.	Combustible charged per hour	lbs.	51·1
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	14·6
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	14·4
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	12·8
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	8·84
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	10·86
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3230
48.	Gas (dry at 60°and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3058
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft	3230
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3058
51.	Calorific value of coal charged per hour	B.T.U.	805000
52.	" " gas produced per hour (lower value)	B.T.U.	328100
53.	Steam used in producer per hour	lbs.	90

ECONOMIC RESULTS.

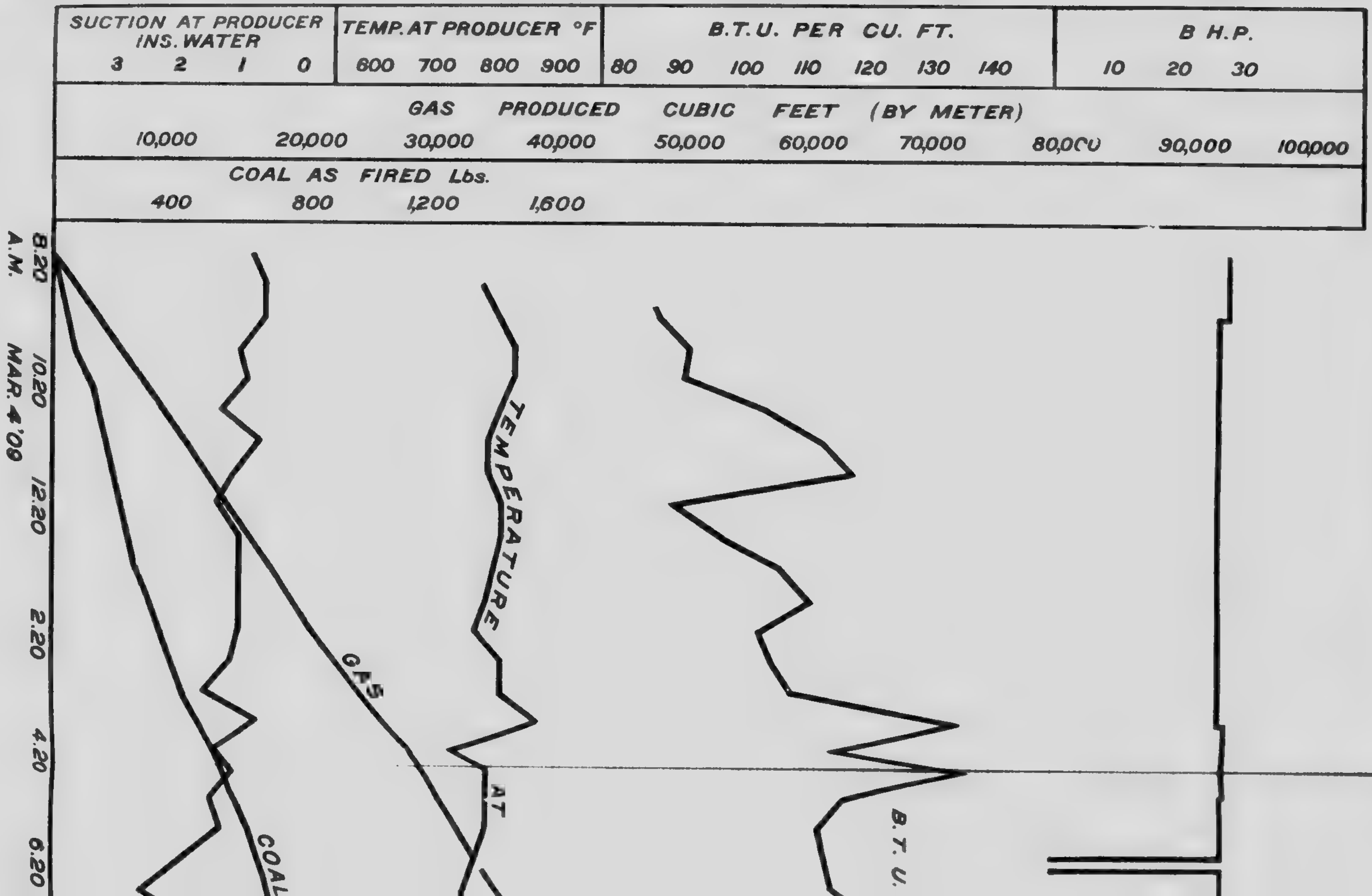
54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	52·5
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	53·2
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	59·8
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	74·0
58.	" " " " " " B.H.P. "	cub. ft.	116·0
59.	Steam used in producer per lb. coal charged	lbs.	1·54
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	23·7
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	429·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	40·8
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	31·5
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	29·1
65.	Thermal efficiency of engine, based on B.H.P	per cent.	20·1
66.	Over all efficiency of producer and engine plant	per cent.	8·35
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12,460
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	30,500

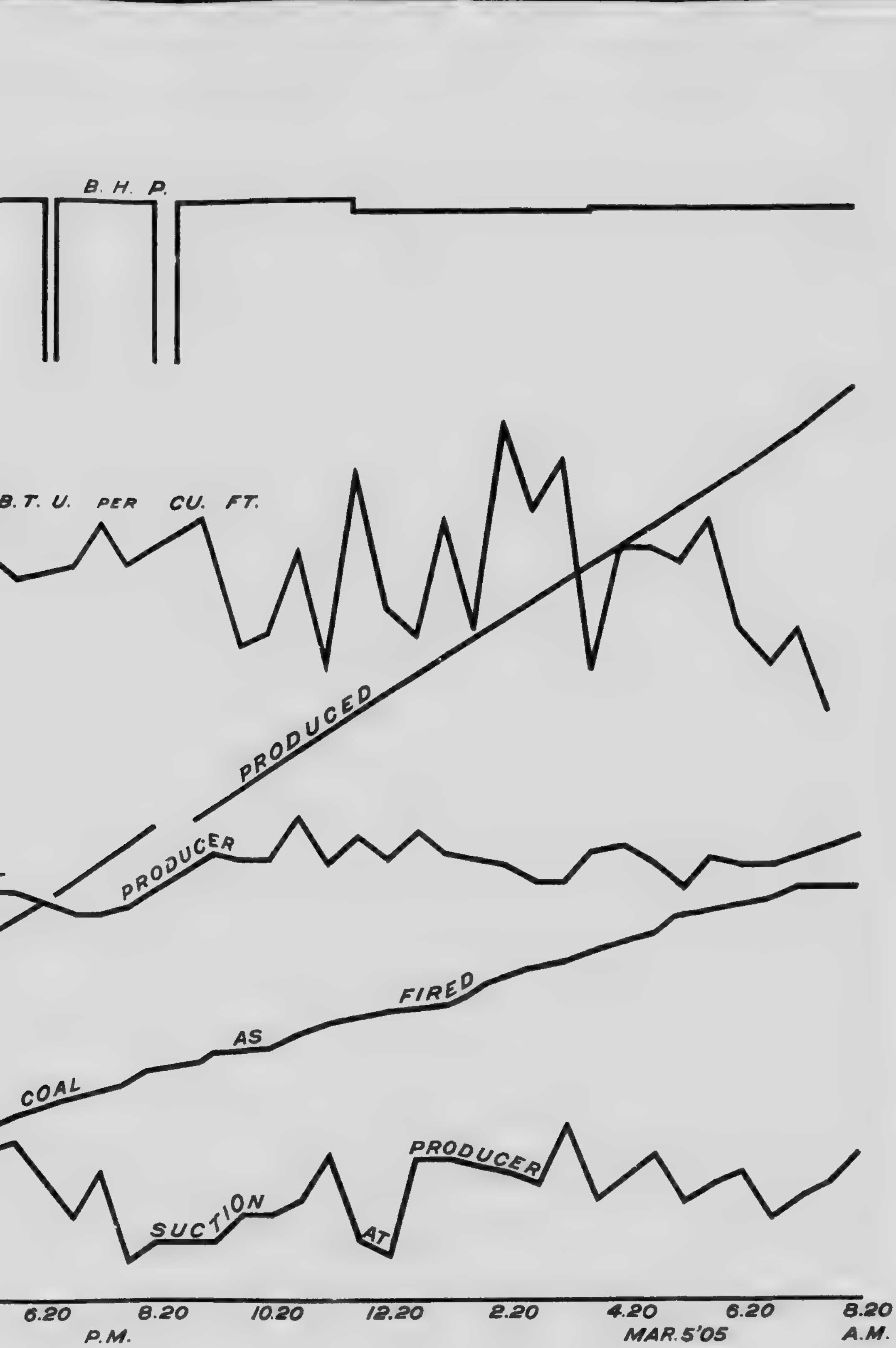
		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·21	2·18	1·94
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·61	2·58	2·29
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·10	3·06	3·72

PRODUCER TRIAL NO. 31 COAL NO. 35

PRODUCER TRIAL NO. 31

COAL NO. 35





APPENDIX III VOL. V

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TRIAL OF No. 4 PRODUCER WITH COAL No. 38

Date—March 15 and 16, 1909. Trial Number—34.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29 68 inches
" " 8.20 p.m., March 15	29 77 "
" " end of trial	29 75 "
Water meter reading at 4 p.m., March 15	04420 imperial gallons
" " " 5 a.m., " 16	06228 " "
Difference for 13 ho	1,808 " "
Brick in producer base	1,080 lbs.
Average level of coal below top plate of producer	18 inches

TIME				
2.50	a.m.,	March	15	Fire started with 10 lbs. of shavings, 40 lbs. of wood, and 120 lbs. of coke.
3.45	"	"	"	Down-draft with tar ex' [illegible] g directly to atmosphere.
4.15	"	"	"	Charged 123 lbs. of coke.
5.10	"	"	"	" 75 " coal.
5.40	"	"	"	" " 75 " "
6.50	"	"	"	" " 50 " "
7.45	"	"	"	" " 50 " "
8.05	"	"	"	Down-draft with blower.
8.10	"	"	"	Charged 75 lbs. coal.
8.15	"	"	"	Started engine.
8.20	"	"	"	Commenced trial.
10.00	"	"	"	Pipe near sawdust scrubber cleaned.
9.40	p.m.,	"	"	Steam blown through gas-washer.
				Trouble with explosion counter throughout trial.
8.20	a.m.,	"	16	Trial completed.

Tar removed from the wet scrubber	122 lbs
Tar removed from the pipes, troughs, etc.	15 "
Wet refuse removed during the trial	928 "
A sample of 230 lbs. of this when dried weighed	164 "
Wet refuse removed after the trial	1,102 "
A sample of 275 lbs. of this when dried weighed	172 "

The valves were not cleaned.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME

Date—March 15 and 16, 1909.

Trial Number—34

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 a.m.	8·7	0·6	0·4	9·6	4·6	11·4	64·7	26·0
10.00 "	10·8	1·4	0·4	7·3	3·6	12·8	63·7	24·1
11 00 "	9·1	1·2	0·4	9·8	3·4	9·9	66·2	23·5
12 00 p.m.	9·7	1·4	0·3	7·7	4·4	10·7	65·8	23·1
1.00 "	9·2	1·2	0·3	7·2	5·2	12·7	64·2	25·1
2.00 "	9·9	0·8	0·5	5·9	5·9	11·0	66·0	23·3
3 00 "	14·5	0·9	0·1	8·8	1·6	15·3	58·8	25·8
4.00 "	11·7	1·0	0·0	12·8	2·3	13·4	58·8	28·5
5 00 "	11·6	0·7	0·2	12·4	2·0	13·6	59·5	28·2
6 20 "	11·9	0·7	0·2	13·3	1·6	12·4	59·9	27·5
7.50 "	9·7	0·7	0·1	13·0	2·6	12·8	61·1	28·[illegible]
9.20 "	7·3	0·9	0·0	16·2	2·1	8·0	65·5	26·3
10.50 "	8·5	0·5	0·2	9·8	3·9	17·2	59·9	31·1
12 20 a.m.	10·0	0·4	0·1	13·7	2·1	10·3	63·4	26·2
1.50 "	9·3	0·5	0·1	11·4	3·5	10·2	65·0	25·2
3 20 "	8·8	0·4	0·2	11·7	3·3	10·7	64·9	25·9
5 20 "	11·7	0·7	0·3	11·7	2·4	14·5	58·7	28·9
6 25 "	8·8	0·6	0·4	9·4	4·8	16·2	59·8	30·8
. 20 "	11·3	0·5	0·1	12·3	2·4	14·4	59·0	29·2

OBSERVATIONS OF GAS METER AND B.H.P.

Date—March 15 and 16, 1909. Trial Number—31.

Notes—[illegible] indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that [illegible] passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks	Loads on tight and slack side of brake.		Net load on brake.	Revolutions counter reading on [illegible]
	cub. ft.			lbs.	lbs.	lbs.	
8 20	2593620		N.B.O.	275	110	165	82400
8 50	2595230	1610	"	275	110	165	
9 20	2596780	1550	"	275	110	165	
9 50	2598480	1700	"	275	110	165	
10 20 "	2600320	1840	"	275	110	165	
10 50 "	2602040	1720	"	250	100	150	
11 20	2603945	1905	"	250	100	150	
11 50 "	2605575	1630	"	250	100	150	
12 20 p.m.	2607155	1580	"	250	100	150	
12 50	2608930	1775	"	275	110	165	
1 20 "	2610300	1370	"	275	110	165	
1 50	2611840	1540	"	275	110	165	
2 20 "	2613200	1360	"	275	110	165	
2 50 "	2615040	1840	"	275	110	165	24670
3 20 "	2616690	1650	"	275	110	165	
3 50 "	2618530	1840	"	275	110	165	
4 20 "	2620425	1895	"	275	110	165	
4 50 "	2622315	1950	"	275	110	165	
5 20 "	2624110	1735	"	275	110	165	
5 50	2625925	1815	"	275	110	165	
6 20 "	2627920	1995	"	275	110	165	
6 50 "	2629720	1800	"	275	110	165	
7 20 "	2631690	1970	"	275	110	165	
7 50 "	2633260	1570	"	275	110	165	
8 20 "	2635090	1830	"	275	110	165	
8 50 "	2636845	1755	"	275	110	165	
9 20 "	2638565	1720	"	275	110	165	
9 50 "	2640270	1760	"	275	110	165	
10 20 "	2642130	1860	"	275	110	165	74159
10 50 "	2643750	1620	"	275	110	165	
11 20 "	2645355	1635	"	275	110	165	
11 50 "	2647150	1765	"	275	110	165	
12 20 a.m.	2648920	1770	"	275	110	165	
12 50 "	2650440	1520	"	275	110	165	
1 20 "	2652230	1790	"	275	110	165	
1 40 "	2653970	1740	"	275	110	165	
2 20 "	2655770	1730	"	275	110	165	
2 50 "	2657470	1770	"	275	110	165	
3 20 "	2659280	1810	"	275	110	165	
3 50 "	2660940	1660	"	275	110	165	69793
4 20 "	2652500	1560	"	275	110	165	
4 50 "	2664200	1700	"	275	110	165	
5 20 "	2665950	1750	"	275	110	165	
5 50 "	2666650	1700	"	275	110	165	
6 20 "	2669370	1720	"	275	110	165	
6 50 "	2670070	1700	"	275	110	165	
7 20 "	2672310	2240	"	275	110	165	
7 50 "	2673440	1630	"	275	110	165	
8 20 "	2675460	1520	"	275	110	165	397[illegible]

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—March 15 and 16, 1909.

Trial Number—34

Note: Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged. lbs.	Total Coal. lbs.	Time of Poking.
			Inlet	Outlet						
8.20 a.m.							8 20 a.m.			8 30 a.m.
8 50 "	53	$\frac{1}{2}$	2·63	15·13	1795	106·5	8 45 "	50	50	8 45 "
9 20 "	54	$\frac{1}{2}$	4·55	12·67	1800	115·8	9 15 "	75	125	9 00 "
9 50 "	54	$\frac{1}{2}$	4·31	11·84	1825	109·9	9 55 "	50	175	9 25 "
10 20 "	55	$\frac{5}{12}$	4·84	11·02	1650	96·9	10.40 "	50	225	9 55 "
10 50 "	56	$\frac{5}{12}$	4·59	10·91	1690	101·5	11 15 "	50	275	10 22 "
11.20 p.m.	56	$\frac{5}{12}$	4·59	11·82	1610	110·7	11 52 "	50	325	10 40 "
11 50 "	56	$\frac{5}{12}$	4·70	11·37	1640	104·0	12 30 p.m.	50	375	10 50 "
12 20 "	57	$\frac{5}{12}$	5·21	11·75	1690	105·0	12 50 "	50	425	11 15 "
12 50 "	58	$\frac{5}{12}$	5·88	11·63	1930	111·0	1 10 "	75	500	11 50 "
1 20 "	58	$\frac{1}{3}$	5·88	11·83	1600	113·1	2 10 "	50	550	12 15 p.m.
1 50 "	58	$\frac{5}{12}$	5·85	14·66	1690	142·0	2 52 "	75	625	1 00 "
2.20 "	58	$\frac{5}{12}$	6·00	14·88	1600	135·0	3 40 "	50	675	1 20 "
2.50 "	62	$\frac{5}{12}$	5·79	11·36	1730	91·6	5 20 "	75	750	2 20 "
3.20 "	63	$\frac{5}{12}$	5·39	13·23	1600	119·0	7 15 "	75	825	5 20 "
3.50 "	62	$\frac{5}{12}$	5·85	12·49	1775	112	8 20 "	50	875	8 20 "
4 20 "	62	$\frac{5}{12}$	[illegible]	12·11	1850	109·3	9 05 "	50	925	8 55
4 50 "	62	$\frac{5}{12}$	[illegible]	12·44	1865	113·5	9 40 "	50	975	
5 20 "	63	$\frac{5}{12}$	6·08	12·31	1940	115·0	10 15 "	50	1025	
5 50 "	63	$\frac{1}{3}$	5·90	11·40	1660	108·6	10.45 "	50	1075	
6 20 "	63	$\frac{7}{12}$	6·08	15·15	1660	102·3	11 30 "	75	1150	
6 50 "	63	$\frac{7}{12}$	6·23	15·28	1650	101·4	12 45 a.m.	50	1200	12 45 a.m.
7.20 "	64	$\frac{7}{12}$	6·07	17·71	1660	126·5	1 35 "	75	1275	1 35 "
7 50 "	64	$\frac{7}{12}$	5·79	15·70	1685	113·4	2 15 "	50	1325	2 15 "
8.20 "	64	$\frac{7}{12}$	5·62	16·41	1800	132·0	3.10 "	50	1375	3 40 "
8.50 "	64	$\frac{7}{12}$	5·74	14·40	1845	108·6	3.40 "	50	1425	
9.20 "	64	$\frac{1}{2}$	5·61	13·41	1710	105·6	4.25 "	50	1475	4 20
9.50 "	64	$\frac{1}{2}$	5·03	13·26	1750	114·1	5 20 "	75	1550	5 40 "
10.20 "	64	$\frac{1}{2}$	4·94	14·07	1855	134·0	6.45 "	50	1600	6 20 "
10 50 "	64	$\frac{5}{12}$	4·83	14·31	1615	145·4	7 30 "	50	1650	
11.20 "	64	$\frac{5}{12}$	4·95	11·23	1620	96·7	8 30 "			
11 50 "	64	$\frac{7}{12}$	4·95	15·27	1740	121·9				
12.20 a.m.	65	$\frac{5}{12}$	5·03	12·73	1610	117·7				
12.50 "	65	$\frac{5}{12}$	4·93	11·70	1735	128·0				
1.20 "	65	$\frac{1}{3}$	5.16	11·47	1600	120·0				
1.50 "	66	$\frac{1}{3}$	4.50	11·50	1600	133				
2.20 "	66	$\frac{5}{12}$	5·28	12·78	1650	117·5				
2.50 "	66	$\frac{5}{12}$	4·45	12·15	1670	138·0				
3.20 "	66	$\frac{5}{12}$	5·27	12·67	1780	125·3				
3.50 "	66	$\frac{1}{3}$	5·18	11·20	1660	118·5				
4.20 "	67	$\frac{5}{12}$	5·10	11·40	1670	100·0				
4.50 "	67	$\frac{1}{3}$	5·10	11·16	1700	122·5				
5.20	67	$\frac{1}{3}$	5·15	10·80	1710	115·0				
6.20 "	67	$\frac{1}{3}$	4·48	11·30	1600	120				
6 50 "	67	$\frac{1}{3}$	4·80	11·22	1610	122·8				
7.20 "	67	$\frac{1}{3}$	4·74	11·60	1950	135·9				

OBSERVATIONS OF TEMPERATURES AND PRESSURES

Date March 15 and 16, 1909. Trial Number 31.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 20 a.m.	560	60	50	95	2·9	4·4	4·6	7·5	4·8	1·8	24	19
8 50 "	720	59	53	165	3·5	6·5	6·7	10·5	3·8	2·4	52	50
9 20 "	740	60	57	122	3·3	5·8	6·0	8·9	4·7	3·5	59	56
9 50 "	800	61	56	133	3·4	6·3	6·5	8·0	3·5	2·1	53	50
10 20 "	780	62	57	130	3·3	6·1	6·3	8·3	4·0	1·1	60	57
10 50 "	800	62	58	131	3·5	6·5	6·7	10·5	4·8	2·1	64	61
11 20 "	820	63	58	125	3·5	6·8	7·0	10·0	4·4	2·2	40	37
11 50 "	780	64	60	132	3·2	5·4	5·6	8·7	3·8	1·9	50	47
12 20 p.m	800	65	61	133	3·5	6·7	6·9	11·2	5·7	2·7	61	58
12 50 "	740	66	62	135	3·3	5·5	5·7	7·3	3·2	0·8	65	62
1 20 "	720	66	65	138	3·2	5·8	6·0	9·5	4·2	1·1	55	52
1 50 "	700	67	65	140	3·1	4·9	5·1	6·7	3·4	1·0	43	40
2 20 "	720	68	65	143	3·5	6·2	6·4	11·2	4·5	1·2	47	43
2 50 "	800	68	67	141	3·4	5·8	6·0	8·9	3·8	1·4	49	46
3 20 "	790	69	67	136	3·3	5·8	6·0	8·9	3·7	1·1	57	53
3 50 "	780	69	66	138	3·7	7·3	7·5	11·3	4·5	1·3	63	58
4 20 "	760	69	65	140	3·5	6·2	6·4	9·1	3·7	1·0	71	66
4 50 "	770	69	66	138	3·5	6·5	6·7	11·0	4·2	1·3	70	66
5 20 "	750	69	65	140	3·2	5·7	5·9	8·0	3·8	1·2	71	66
5 50 "	800	69	65	137	3·9	8·1	8·3	11·0	4·1	1·1	65	61
6 20 "	760	69	64	137	3·3	5·9	6·1	7·3	3·2	0·6	47	42
6 50 "	770	69	65	138	3·6	7·1	7·3	8·9	3·5	0·7	33	29
20 "	780	70	66	135	3·3	5·5	5·7	7·2	3·5	0·8	48	43
50 "	760	70	67	131	3·4	6·4	6·6	9·0	4·1	1·2	62	58
8 20 "	740	69	65	131	3·3	6·2	6·4	8·8	4·1	1·3	62	57
8 50 "	720	69	66	130	3·1	5·5	5·7	8·7	5·0	2·8	75	71
9 20 "	740	70	66	129	3·4	5·9	6·1	10·2	5·3	2·5	61	56
9 50 "	750	69	65	122	3·4	6·0	6·2	9·2	4·1	2·0	61	57
10 20 "	760	70	65	122	3·4	5·9	6·1	9·2	4·5	2·8	58	54
10 50 "	750	68	65	125	3·4	5·6	5·8	8·7	4·4	1·2	58	54
11 20 "	730	68	66	128	3·5	6·5	6·7	10·3	5·3	2·5	63	59
11 50 "	760	67	66	123	3·5	6·8	7·0	10·0	4·4	1·3	70	66
12 20 a.m.	720	66	67	130	3·2	5·3	5·5	7·0	3·5	1·3	63	59
12 50 "	680	66	67	123	3·2	5·7	5·9	9·6	5·3	2·5	59	56
1 20 "	760	66	67	131	3·4	6·6	6·8	10·0	4·3	1·5	55	57
1 50 "	780	65	68	130	3·4	6·0	6·2	9·8	5·0	2·9	72	69
2 20 "	780	66	69	129	3·5	7·0	7·2	10·1	4·8	2·4	73	68
2 50 "	720	67	68	133	3·2	5·8	6·0	7·4	3·5	1·9	70	67
3 20 "	760	67	69	130	3·4	6·5	6·7	8·9	3·6	2·2	53	19
3 50 "	760	68	69	126	3·5	6·0	6·2	9·2	4·6	2·6	58	54
4 20 "	780	67	68	130	3·0	5·2	5·4	9·2	7·0	5·2	62	57
4 50 "	780	67	68	130	3·4	6·4	6·6	9·9	4·7	1·6	72	68
5 20 "	800	66	68	130	3·5	6·8	7·0	9·9	4·0	0·8	63	58
5 50 "	790	67	68	130	3·2	6·5	6·7	9·2	4·5	2·7	64	60
6.20 "	730	67	67	129	3·0	5·2	5·4	11·9	6·2	3·6	65	62
6 50 "	750	67	67	129	3·2	5·4	5·6	10·8	4·2	1·7	64	61
7 20 "	760	66	68	136	3·0	5·6	5·8	9·8	3·8	1·7	62	59
7.50 "	780	66	67	139	3·2	5·4	5·6	9·6	3·7	1·6	58	55
8 20 "	760	65	65	132	3·1	6·0	6·2	9·7	3·2	1·6	60	57

PRODUCER TRIAL No. 34.

Date—March 15-16, 1909. Producer No. 4, at McGill University.

Time of lighting up—2.50 a.m. Trial commenced 8.20 a.m. March 15; ended 8.20 a.m. March 16.

Duration of trial—24 hours. Kind of fuel—No. 38 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Campbell, Nicolls, Stansfield.

SUMMARY OF OBSERVATIONS

	FUEL.		
1.	Total coal charged during trial	"	1650
2.	Moisture in coal as charged	per cent	2·2
3.	Calorific value of coal as charged, per lb.	B.T.U.	700
4.	" " of dry coal per lb.	B.T.U.	010
5.	Proximate analysis of coal as charged (by weight): fixed carbon 58·8; volatile matter, 32·5, ash, 6·5; moisture, 2·2		
6.	Combustible in dry refuse removed during trial. fixed carbon, 67·3; volatile matter, 7·7 ... Total	per cent	75·0
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	12
	GAS.		
8.	Total gas produced during trial (from meter readings)	cub. ft.	81840
9.	Average temperature of gas leaving producer	°	716
10.	" " " at meter	°	66·5
11.	Average temperature of air in producer house	°	65
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	116·5
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	120·0
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	110
14.	Average barometric pressure	lbs. sq. in.	14·56
15.	" suction at producer	ins. of water	[illegible]
16.	" suction at exhauster	ins. of water	[illegible]
17.	" pressure of gas at meter	ins. of water	4·7
	STEAM, WATER, ETC.		
18.	Total steam used in producer during trial	lbs.	2184
19.	" water used in scrubber and gas washer	lbs.	39080
20.	" tar extracted in scrubber and gas washer	lbs.	137
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5
	ENGINE.		
23.	Total revolutions during trial (from counter)		15220
24.	Average explosions per minute		101
25.	Average effective load on brake	lbs.	10[illegible]·7
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	67·1
28.			

Notes.

Fire poked at: 8.30, 8.45, 9.00, 9.25, 9.55, 10.20, 10.49, 10.50, 11.15, 11.50 a.m.; 12.15, 1 [illegible] 5.20, 8.20, 8.55 p.m.; 12.45, 1.35, 2.15, 3.40, 4.20, 5.40, 6.20 a.m.

Refuse removed at: 9.55, 11.15, 11.55 a.m.; 2.30, 5.20, 11.40 p.m.; 1.20, 1.50, 4 [illegible]

Behaviour of coal: Required a good deal of attention.

Average time between poking: 1 hour.

Clinker: No record of special clinker difficulties.

Tar: A good deal produced.

State of engine valves at end of trial: Did not need cleaning.

Valves last cleaned: March 9, 1909.

29. ANALYSIS OF DRY COAL.

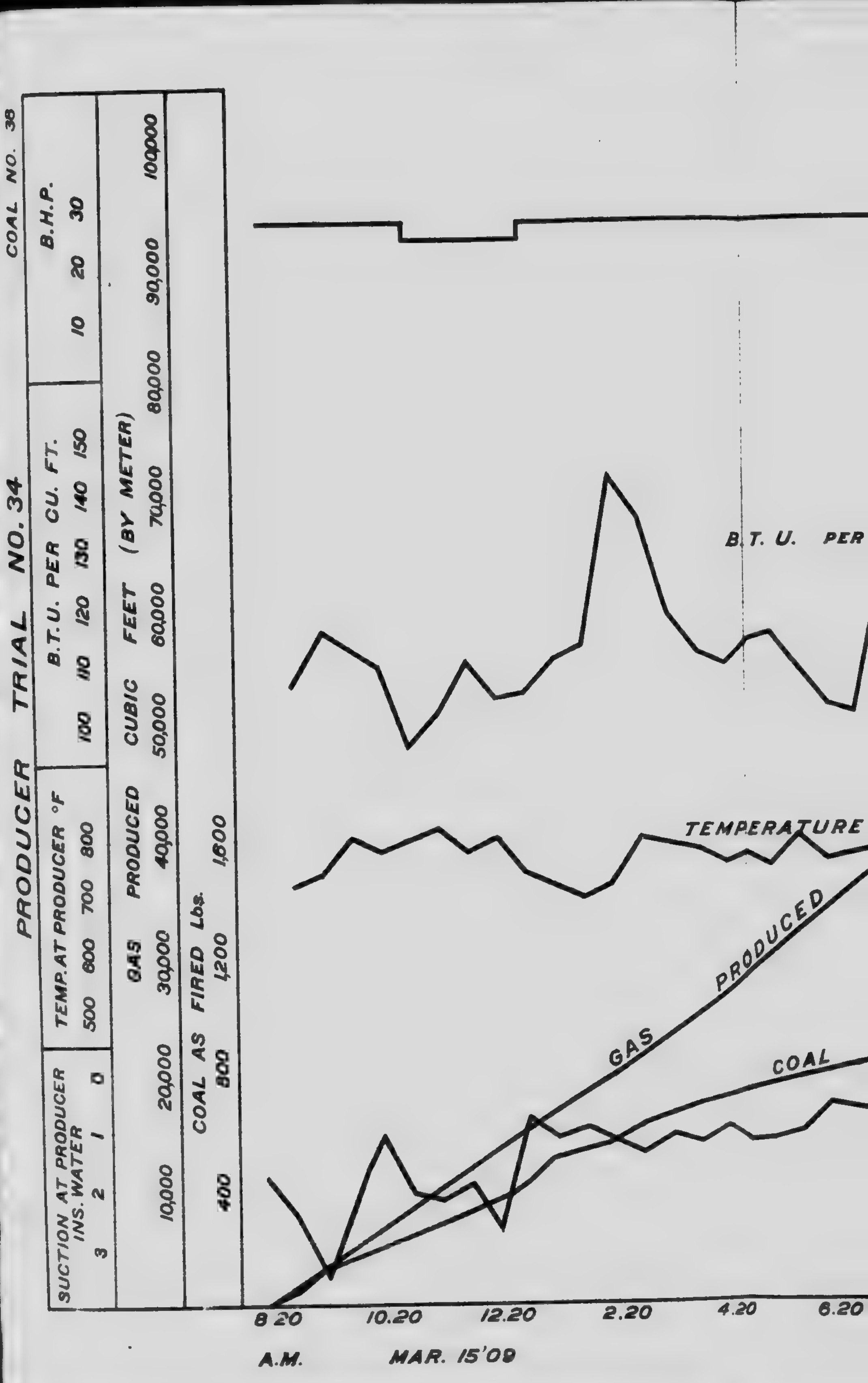
Hydrogen	5·1%
Carbon	76·6%
Nitrogen	1·5%
Oxygen	7·0%
Sulphur	1·9%
Total carbon contained by dry coal charged	1268·0 lbs.

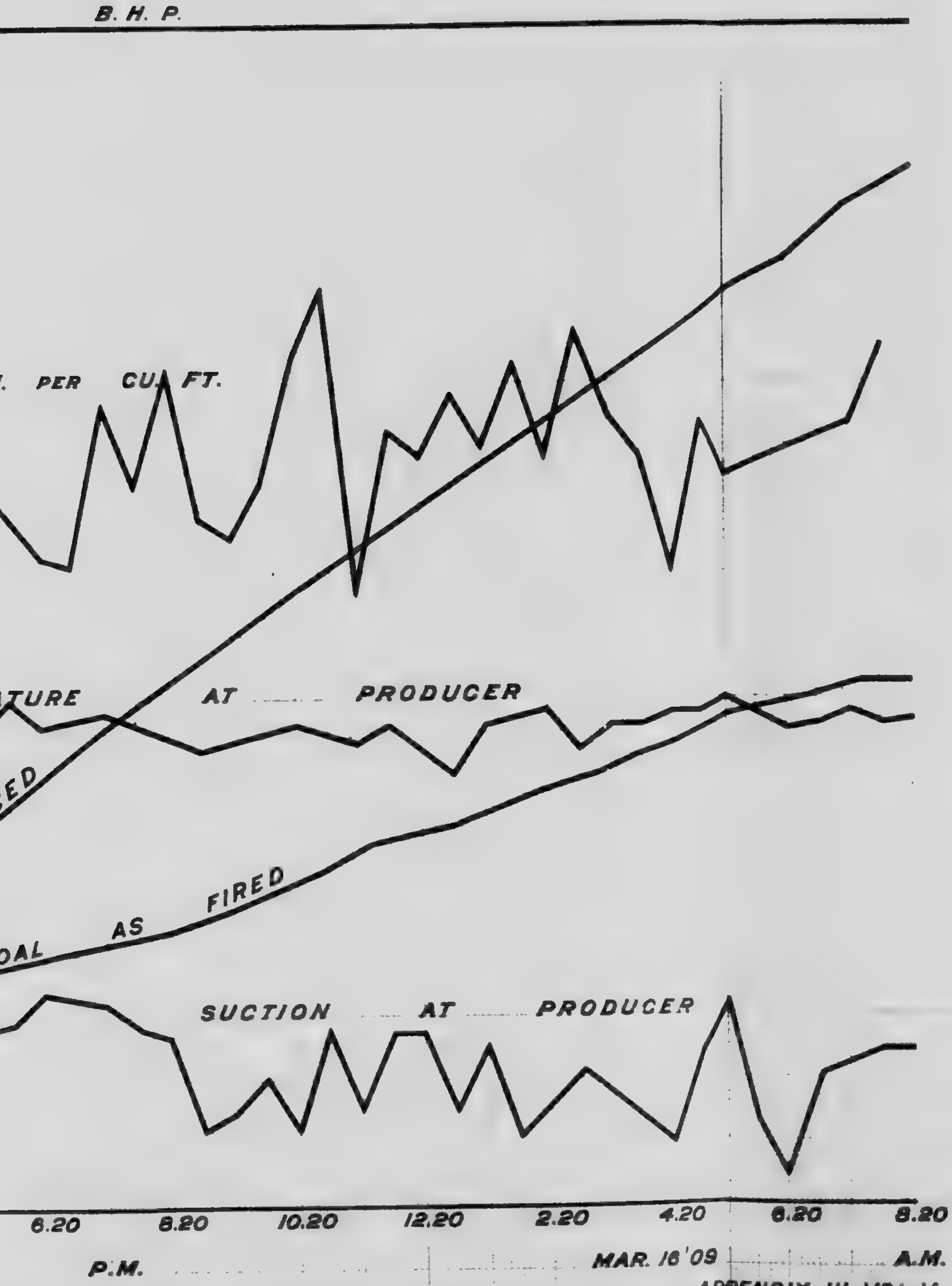
30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	10·1%
Oxygen	0·8%
Carbon monoxide	10·7%
Hydrogen	12·5%
Methane	3·3%
Ethylene	0·2%
Nitrogen	62·4%

PRODUCER TRIAL NO. 34

COAL NO. 35


PRODUCER TRIAL NO. 34
COAL NO. 38
SUCTION AT PRODUCER INS. WATER
3
2
1
0
TEMP. AT PRODUCER °F
500
600
700
800
B.T.U. PER CU. FT.
100
110
120
130
140
150
B.H.P.
10
20
30
GAS PRODUCED CUBIC FEET (BY METER)
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
COAL AS FIRED Lbs.
400
800
1,200
1,600
B.T.U. PER
TEMPERATURE
GAS PRODUCED
COAL
8 20
10.20
12.20
2.20
4.20
6.20
A.M.
MAR. 15'09



APPENDIX III VOL.V

1
1

1
1
2
2
2

2
2
2
2
2

2

5

2

Remarks.

Required a good deal of attention, giving lots of tar at the wet scrubber and burning very quickly; refuse could probably have been fired again; engine ran steadily during trial and gave no trouble. Tar washer bearings ran warm. This coal as a whole is not very satisfactory for producer work.

SUMMARY OF RESULTS.

Total Quantities.

No.	Item	Unit	Value
31.	Dry coal charged during trial	lbs.	1613
32.	Combustible charged d[illegible]al	lbs.	[illegible]
33.	Average B.H.P. of engi[illegible] trial	H.P.	[illegible]·6
34.	" indicated H.P. [illegible]ring trial	H.P.	38·8
35.	" H.P. taken by exha[illegible] gas washer	H.P.	4·0
36.	" B.H.P. while gas consu[illegible] of engine was taken	H.P.	26·16
37.	" " corresponding to total gas produced	H.P.	26·16
38.	" " " " " " and available for outside use, allowing for power used	H.P.	22·16

Hourly Quantities.

No.	Item	Unit	Value
39.	Coal charged per hour	lbs.	68·75
40.	Dry coal charged per hour	lbs.	67·25
41.	Combustible charged per hour	lbs.	62·8
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	17·2
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	16·8
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	15·7
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	10·52
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·08
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3410
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3303
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3410
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3303
51.	Calorific value of coal charged per hour	B.T.U.	942000
52.	" " gas produced per hour (lower value)	B.T.U.	363300
53.	Steam used in producer per hour	lbs.	91·0

Economic Results.

No.	Item	Unit	Value
54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	48·1
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	49·1
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	52·6
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	85·1
58.	" " " " " B.H.P. "	cub. ft.	126·3
59.	Steam used in producer per lb. coal charged	lbs.	1·32
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	23·70
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	477·5
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	38·5
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	32·6
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	28·4
65.	Thermal efficiency of engine, based on B.H.P	per cent.	18·3
66.	Over all efficiency of producer and engine plant	per cent.	7·06
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13,890
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	36,030

No.	Item	Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·63	2·57	2·40
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	3·11	3·01	2·84
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·56	3·48	3·25

TRIAL OF No. 4 PRODUCER WITH COAL No. 37

Date—March 11 and 12, 1909.

Trial Number—33.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·63 inches.
" " 10.10 p.m., March 11	29·96 "
" end of trial	30·01 "
Water meter reading at 10.30 p.m., March 11	00434 imperial gallons.
" " " 10.00 a.m., " 12	03261 " "
Difference, in 23½ hours	2,827 " "
Brick in producer base	961 lbs.
Average level of fuel below top plate of producer	17 inches.

4.50	a.m., March	11	Fire started with 10 lbs. shavings, 40 lbs. of wood, 126 lbs. of coke.
6.30	" "	"	Down-draft with fan exhausting directly to the atmosphere.
6.45	" "	"	Charged 104 lbs of coke.
7.30	" "	"	" 78 " "
8.00	" "	"	" 75 " coal.
8.30	" "	"	" 75 " "
9.30	" "	"	" 25 " "
9.50	" "	"	Down-draft with blower.
10.00	" "	"	Started engine
10.10	" "	"	Started trial.
10.10	" "	12	Trial finished.

Explosion counter gave trouble. The gas-washer was not used during this trial, the sawdust scrubber being substituted. Tar and dirt in the pipe between the wet scrubber and sawdust scrubber caused a rather high suction The valves were not cleaned during or after the trial.

Tar removed from wet scrubber after the trial	77 lbs.
Tar removed from tar box	10
Tar removed from pipes, etc	10
Wet refuse removed during the trial	260
A sample of 130 lbs. of this when dried weighed	87
Wet refuse removed after the trial	1,367
A sample of 275 lbs. of this when dried weighed	174

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 11 and 12, 1909. Trial Number—33.

Note: R. and B. apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
10.00 a.m.....	10·4	0·7	0·0	7·6	3·2	2·9	75·2	13·7
11 00 "	10·5	0·4	0·0	13·1	2·5	8·4	65·1	24·0
12 00 p.m.....	10·7	0·5	0·0	13·4	2·5	7·7	65·2	23·6
1.00 "	10·4	0·5	0·0	11·1	3·1	8·3	66·5	22·5
2.00 "	9·6	0·5	0·1	10·8	4·3	13·4	61·3	28·6
3.00 "	10·3	0·4	0·0	12·7	2·5	7·5	66·6	22·7
4.00 "	9·6	1·0	0·3	7·9	5·4	11·7	64·1	25·3
5 00 "	11·7	0·6	0·0	10·4	3·3	14·3	59·7	28·0
7.00 "	9·6	0·4	0·0	15·0	2·4	9·7	62·9	27·1
8.10 "	9·9	0·3	0·0	12·8	2·1	10·7	64·2	25·6
10 10 "	14·1	0·4	0·0	11·8	2·1	15·1	56·5	29·0
11 10 "	12·2	0·3	0·1	9·7	3·0	11·9	62·8	24·7
12 40 a.m.....	10·6	0·4	0·0	11·5	2·0	10·4	65·1	23·9
2 10 "	8·5	0·2	0·0	13·4	2·0	13·0	62·9	28·4
3 40 "	9·8	0·5	0·0	13·5	2·6	14·3	59·3	30·4
5 40 "	10·5	0·4	0·0	12·5	3·1	14·6	58·9	30·2
6.40 "	13·5	0·2	0·0	12·3	1·6	11·7	60·7	25·6
7.40 "	13·4	0·2	0·0	11·4	2·1	17·3	55·6	30·8
8.40 "	10·1	0·2	0·1	15·2	2·3	13·8	58·3	31·4

OBSERVATIONS OF GAS METER AND B. H. P.

Date—March 11 and 12, 1909.

Trial Number—33.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
10.10 a.m.	2510530	......	N.B.O.	225	87	138	99470
10.40 "	2512220	1690	"	225	87	138	
11.10 "	2514120	1900	"	275	107	168	
11.40 "	2515870	1750	"	275	107	168	28265
12.10 p.m.	2518020	2150	"	275	107	168	
12.40 "	2519870	1850	"	275	107	168	
1.10 "	2521880	2010	"	275	107	168	
1.40 "	2523670	1790	"	275	107	168	
2.10 "	2525560	1890	"	250	95	155	
2.40 "	2527340	1780	"	250	95	155	
3.10 "	2529200	1860	"	250	95	155	
3.40 "	2530750	1550	"	250	95	155	
4.10 "	2532400	1650	"	250	95	155	
4.40 "	2534220	1820	"	250	95	155	
5.10 "	2535980	1760	"	250	95	155	
5.40 "	2537670	1690	"	250	95	155	
6.10 "	2539270	1600	"	250	95	155	
6.40 "	2541060	1790	"	250	95	155	
7.10 "	2542880	1820	"	250	95	155	
7.40 "	2544730	1850	"	250	95	155	
8.10 "	2546500	1770	"	250	95	155	
8.40 "	2548220	1720	"	250	95	155	
9.10 "	2550940	1720	"	250	95	155	
9.40 "	2552240	1300	"	250	95	155	
10.10 "	2553910	1670	"	250	95	155	
10.40 "	2554920	1010	"	250	95	155	
11.10 "	2556520	1600	"	250	95	155	
11.40 "	2558170	1650	"	250	95	155	
12.10 a.m.	2559960	1600	"	250	95	155	
12.40 "	2561555	1595	"	250	95	155	
1.10 "	2563180	1625	"	250	95	155	
1.40 "	2564780	1600	"	250	95	155	
2.10 "	2566170	1390	"	250	95	155	
2.40 "	2567770	1600	"	250	95	155	
3.10 "	2569225	1455	"	250	95	155	
3.40 "	2571060	1835	"	250	95	155	
4.10 "	2572680	1620	"	250	95	155	
4.40 "	2574410	1730	"	250	95	155	
5.10 "	2576125	1715	"	250	95	155	
5.40 "	2577650	1525	"	250	95	155	
6.10 "	2579365	1715	"	250	95	155	
6.40 "	2580940	1575	"	250	95	155	
7.10 "	2582685	1745	"	250	95	155	
7.40 "	2584555	1870	"	250	95	155	
8.10 "	2586100	1545	"	250	95	155	
8.40 "	2589850	1750	"	250	95	155	
9.10 "	2589575	1725	"	250	95	155	
9.40 "	2591225	1650	"	250	95	155	
10.10 "	2592860	1635	"	250	95	155	81060

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—March 11 and 12, 1909. Trial Number 33.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
10.10 a.m.	55	$\frac{7}{12}$	7·55	14·79	1600	78·7	10.10 a.m.	......	......	
10.40 "	55	$\frac{2}{3}$	6·72	15·91	1735	94·6	10.15 "	50	50	...
11.10 "	57	$\frac{7}{12}$	5·74	16·97	1605	122·6	11 05 "	50	100	11 05 a.m.
11.40 "	57	$\frac{7}{12}$	5·81	14·79	1610	98·4	11.35 "	50	150	11 50 "
12.10 p.m.	58	$\frac{1}{2}$	5·93	14·01	1600	102·5	12.05 p.m.	25	175	12.45 p.m.
12.40 "	59	$\frac{1}{2}$	5·62	12·77	1670	94·5	12.30 "	50	225	......
1.10 "	59	$\frac{1}{2}$	5·74	13·62	1810	113·1	1.00 "	50	275	......
1 40 "	59	$\frac{5}{12}$	5·75	12·39	1620	102·3	1.30 "	50	325	....
2.10 "	60	$\frac{7}{12}$	5·93	13·83	1785	95·8	2.10 "	50	375	.....
2.40 "	60	$\frac{7}{12}$	5·94	14·29	1780	101·0	3.00 "	50	425	3 10 "
3.10 "	61	$\frac{7}{12}$	6·17	16·48	1770	124·0	3.15 "	25	450	.....
3.40 "	62	$\frac{1}{2}$	6·35	13·52	1650	93·7	3.50 "	50	500	3.45 "
4.10 "	63	$\frac{7}{12}$	6·36	13·95	1665	100·3	4.55 "	50	550	....
4.40 "	64	$\frac{1}{2}$	6·52	13·99	1685	99·0	5.30 "	50	600	.....
5.10 "	64	$\frac{1}{2}$	6·52	14·43	1745	109·4	6.25 "	50	650	....
5.40 "	65	$\frac{1}{2}$	6·51	13·64	1825	103·0	7.30 "	50	700	7 30 "
6.10 "	65	$\frac{5}{12}$	6·50	13·21	1600	102	8.40 "	50	750	....
6.40 "	65	$\frac{5}{12}$	6·86	12·98	1700	98·8	9.40 "	50	800	......
7.10 "	65	$\frac{5}{12}$	7·08	12·53	1860	96·4	11 00 "	50	850	11.00 "
7.40 "	66	$\frac{1}{3}$	6·60	12·08	1600	104·3	12.00 a.m.	75	925	12 00 a.m.
8.10 "	66	$\frac{1}{3}$	6·40	10·70	1730	88·3	1.00 "	75	1000	12.35 "
8.40 "	66	$\frac{1}{3}$	5·98	11·46	1820	129·5	1.40 "	50	1050	1 00 "
9.10 "	66	$\frac{1}{3}$	7·35	12·94	1700	113	2.30 "	50	1100	1 40
9.40 "	66	$\frac{1}{2}$	7·29	12·09	1840	105	3.35 "	50	1150	2 30 "
10.10 "	66	$\frac{1}{3}$	7·37	11·87	2040	109·2	4.50 "	50	1200	3.15 "
10.40 "	......	......	......	......	......	......	5.40 "	50	1250	5 35 "
11.10 "	67	$\frac{7}{12}$	6·90	16·46	1600	103·8	6.50 "	50	1300	..
11.40 "	67	$\frac{7}{12}$	6·90	15·03	1760	97·3	7.30 "	50	1350	
12 10 a.m.	67	$\frac{1}{2}$	6·87	16·38	1600	120·3	8.30 "	50	1400	
12.40 "	67	$\frac{1}{2}$	6·34	14·98	1615	110·6	9.30 "	50	1450	
1.10 "	67	$\frac{1}{2}$	6·35	15·41	1730	123·4				
1.40 "	67	$\frac{1}{2}$	6·61	16·03	1750	131·4				
2.10 "	65	$\frac{5}{12}$	6·36	13·14	1670	107·6				
2.40 "	65	$\frac{1}{2}$	6·58	14·67	1600	102·6				
3.10 "	65	$\frac{1}{2}$	6·60	14·48	1620	101·2				
3.40 "	65	$\frac{1}{2}$	6·68	15·62	1710	121·0				
4.10 "	65	$\frac{1}{2}$	6·71	13·94	1770	102·3				
4.40 "	65	$\frac{1}{2}$	6·78	13·63	1780	96·5				
5.10 "	65	$\frac{1}{2}$	6·81	14·71	1800	112·6				
5.40 "	65	$\frac{1}{2}$	6·78	14·74	1805	113·7				
6.10 "	65	$\frac{5}{12}$	6·67	14·08	1600	112·7				
6.40 "	65	$\frac{5}{12}$	6·65	12·97	1625	97·5				
7.10 "	65	$\frac{2}{3}$	6·63	17·31	1660	105·5				
7 40 "	65	$\frac{2}{3}$	6·52	18·67	1670	120·7				
8.10 "	65	$\frac{7}{12}$	6·51	16·23	1600	105·7				
8.40 "	65	$\frac{7}{12}$	6·50	15·89	1680	101·2				
9.10 "	65	$\frac{7}{12}$	6·55	14·89	1770	100·3				
9.40 "	65	$\frac{1}{2}$	6·63	14·54	1660	103·8				

OBSERVATIONS OF TEMPERATURES AND PRESSURES

Date—March 11 and 12, 1909. Trial Number—33.

Time.	TEMPERATURES. °F.				PRESSURE. Ins. of Water.			SUCTION. Ins. of Water.			STEAM PRESSURE.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
10.10 a.m.	760	58	56	88	3·1	7·2	7·4	6·0	3·0	1·1	48	43
10.40 "	820	60	58	158	3·4	6·8	7·0	7·0	3·2	1·5	47	42
11.10 "	910	62	60	124	3·9	7·2	7·4	7·5	3·2	1·1	61	57
11.40 "	840	62	61	126	3·3	6·9	7·1	7·7	3·4	1·3	70	67
12.10 p.m.	880	63	62	124	3·5	6·4	6·6	6·7	3·5	1·5	70	65
12 40 "	900	64	63	128	3·3	6·0	6·2	7·9	4·1	1·7	70	57
1.10 "	890	64	63	133	3·3	6·5	6·7	7·4	3·7	1·6	50	46
1.40 "	900	64	62	133	3·7	7·5	7·7	9·0	3·2	2·0	58	55
2.10 "	860	64	63	139	3·4	6·1	6·2	8·0	3·5	1·5	70	67
2.40 "	880	65	63	140	3·5	6·6	6·8	9·5	4·2	2·2	65	62
3.10 "	930	65	65	138	3·9	8·1	8·3	9·9	3·8	1·7	68	65
3 40 "	820	65	65	141	3·0	5·0	5·2	7·6	3·6	2·0	68	65
4.10 "	910	66	66	143	3·5	6·6	6·8	9·6	4·0	1·8	55	50
4.40 "	900	66	66	137	3·5	6·7	6·9	9·4	3·8	1·5	45	40
5 10 "	860	66	66	140	3·4	6·0	6·2	8·1	3·3	1·2	43	39
5.40 "	880	68	67	138	3·5	6·5	6·7	9·4	3·5	1·2	30	27
6.10 "	860	68	67	138	3·7	6·5	6·7	9·5	3·0	1·0	26	22
6.40 "	860	68	67	138	3·2	5·5	5·7	8·0	3·2	1·0	70	65
7.10 "	860	68	67	136	3·6	6·8	7·0	9·6	3·5	1·4	47	43
7.40 "	900	70	68	132	4·0	6·8	7·0	10·0	4·0	1·6	52	48
8 10 "	880	70	68	128	3·9	7·0	7·2	9·0	4·0	2·1	71	68
8.40 "	850	70	67	130	3·3	6·9	7·1	7·6	3·2	1·2	72	69
9 10 "	880	68	68	137	3·6	7·0	7·2	10·0	4·1	2·3	60	56
9.40 "	850	68	68	133	3·5	6·0	6·2	9·6	3·8	1·8	60	57
10 10 "	900	68	69	130	3·3	5·5	5·7	8·1	3·0	1·0	48	45
10 40 "	860	70	68	128	3·3	5·5	5·7	8·6	3·1	1·0	50	47
11.10 "	870	70	68	128	3·5	6·0	6·2	8·9	3·4	1·1	64	61
11 40 "	860	70	68	128	3·6	7·0	7·2	10·0	3·6	1·1	45	41
12 10 a.m.	830	70	68	125	3·2	5·0	5·2	8·6	3·6	1·0	39	36
12 40 "	840	69	67	125	3·3	5·9	6·1	9·8	3·5	0·8	62	59
1.10 "	840	69	68	129	3·2	5·3	5·5	11·0	4·2	1·4	63	60
1.40 "	850	69	68	130	3·4	5·7	5·9	11·0	3·5	1·0	67	64
2 10 "	820	69	62	133	3·5	6·0	6·2	11·8	4·6	2·6	64	61
2.40 "	800	69	67	130	3·5	6·1	6·3	11·6	4·3	2·4	71	68
3.10 "	800	69	66	127	3·6	6·1	6·3	12·0	4·3	2·7	70	67
3.40 "	830	69	67	131	3·4	5·7	5·9	11·1	3·6	1·2	71	67
4.10 "	820	69	68	134	3·4	6·0	6·2	11·4	3·6	1·1	78	75
4.40 "	840	69	68	130	3·6	6·9	7·1	12·0	3·6	1·0	80	77
5.10 "	830	69	67	137	3·3	5·4	5·6	11·4	3·6	1·2	63	60
5.40 "	820	68	66	132	3·3	5·8	6·0	11·7	3·5	1·0	71	68
6.10 "	840	68	66	139	3·3	5·4	5·6	10·9	3·3	1·1	71	67
6.40 "	860	68	66	135	3·4	6·0	6·2	12·0	3·6	1·2	73	68
7.10 "	840	68	66	131	3·5	6·3	6·5	12·5	4·0	1·5	80	77
7.40 "	860	68	66	133	3·3	6·0	6·2	12·5	3·7	1·2	40	36
8.10 "	850	68	66	131	3·6	7·1	7·3	12·9	4·0	1·5	55	51
8.40 "	850	68	64	130	3·6	6·9	7·1	12·9	4·4	2·1	68	64
9 10 "	810	68	65	131	3·5	6·2	6·4	12·1	3·8	1·5	59	55
9.40 "	760	68	66	131	3·2	5·1	5·3	11·3	3·3	2·1	70	66
10.10 "	780	68	66	131	3·4	6·3	6·5	12·7	4·1	2·1	65	61

PRODUCER TRIAL No. 33.

Date—March 11-12, 1909. Producer No. 4, at McGill University.

Time of lighting up—4.50 a.m. Trial commenced 10.10 a.m., March 11; ended 10.10 a.m., March 12.

Duration of trial—24 hours. Kind of fuel—No. 37 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

	FUEL.		
1.	Total coal charged during trial	lbs.	1450
2.	Moisture in coal as charged	per cent.	2·1
3.	Calorific value of coal as charged, per lb.	B.T.U.	12840
4.	" " of dry coal per lb.	B.T.U.	13120
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 52·6; volatile matter, 34·2; ash, 11·1; moisture, 2·1	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 47·6; volatile matter, 3·6	Total per cent.	51·2
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43
	GAS.		
8.	Total gas produced during trial (from meter readings)	cub. ft.	82330
9.	Average temperature of gas leaving producer	°F.	812
10.	" " " at meter	°F.	67
11.	Average temperature of air in producer house	°F.	66
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	105·9
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	108·9
13b.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	100·3
14.	Average barometric pressure	lbs. sq in.	14·64
15.	" suction at producer	ins. of water	1·5
16.	" suction at exhauster	ins. of water	9·9
17.	" pressure of gas at meter	ins. of water	4·86
	STEAM, WATER, ETC.		
18.	Total steam used in producer during trial	lbs.	2184
19.	" water used in scrubber and gas washer	lbs.	28860
20.	" tar extracted in scrubber and gas washer	lbs.	97
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	-
	ENGINE.		
23.	Total revolutions during trial (from counter)		319120
24.	Average explosions per minute		99·7
25.	Average effective load on brake	lbs.	156·0
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	61·57

28. **Notes.**

Fire poked at: 11.05, 11.50 a.m.; 12.45, 3.10, 3.45, 7.30, 11.00 p.m.; 12.00, 12.35, 1.00, 1.40, 2.30, 3.15, 5.35 p.m.
Refuse removed at: Not recorded
Behaviour of coal: Required little attention
Average time between poking: 1 hr. 45 min.
Clinker: No trouble.
Tar: Some trouble.
State of engine valves at end of trial: Did not need cleaning
Valves last cleaned: March 9, 1909

29. ANALYSIS OF DRY COAL.

Hydrogen	4·9%
Carbon	73·3%
Nitrogen	1·2%
Oxygen	7·0%
Sulphur	2·5%
Total carbon contained by dry coal charged	1040·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	10·8%
Oxygen	0·4%
Carbon monoxide	11·9%
Hydrogen	11·4%
Methane	2·7%
Ethylene	0·0%
Nitrogen	[illegible]

REMARKS.

This coal seems fairly well suited for producer work, requiring little attention in the fire. The gas washer was not run during this trial as the bearings needed repairing. The sawdust scrubber was used and apparently worked well. Suction is rather high due to tar and dirt in the pipe from the wet scrubber to the sawdust scrubber. The dirt and tar seem to be the chief faults of this coal. The gas enabled the engine to run steadily during the trial.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	1420
33.	Average B.H.P. of engine during trial	lbs.	1259
34.	" indicated H.P. of engine during trial	H.P.	25·22
35.	" H.P. taken by exhauster and gas washer	H.P.	35·10
36.	" B.H.P. while gas consumption of engine was taken	H.P.	2·5
37.	" " corresponding to total gas produced	!I.P.	25·22
38.	" " " " " " and	H.P.	25·22
	available for outside use, allowing for power used	H.P.	22·72

HOURLY QUANTITIES.

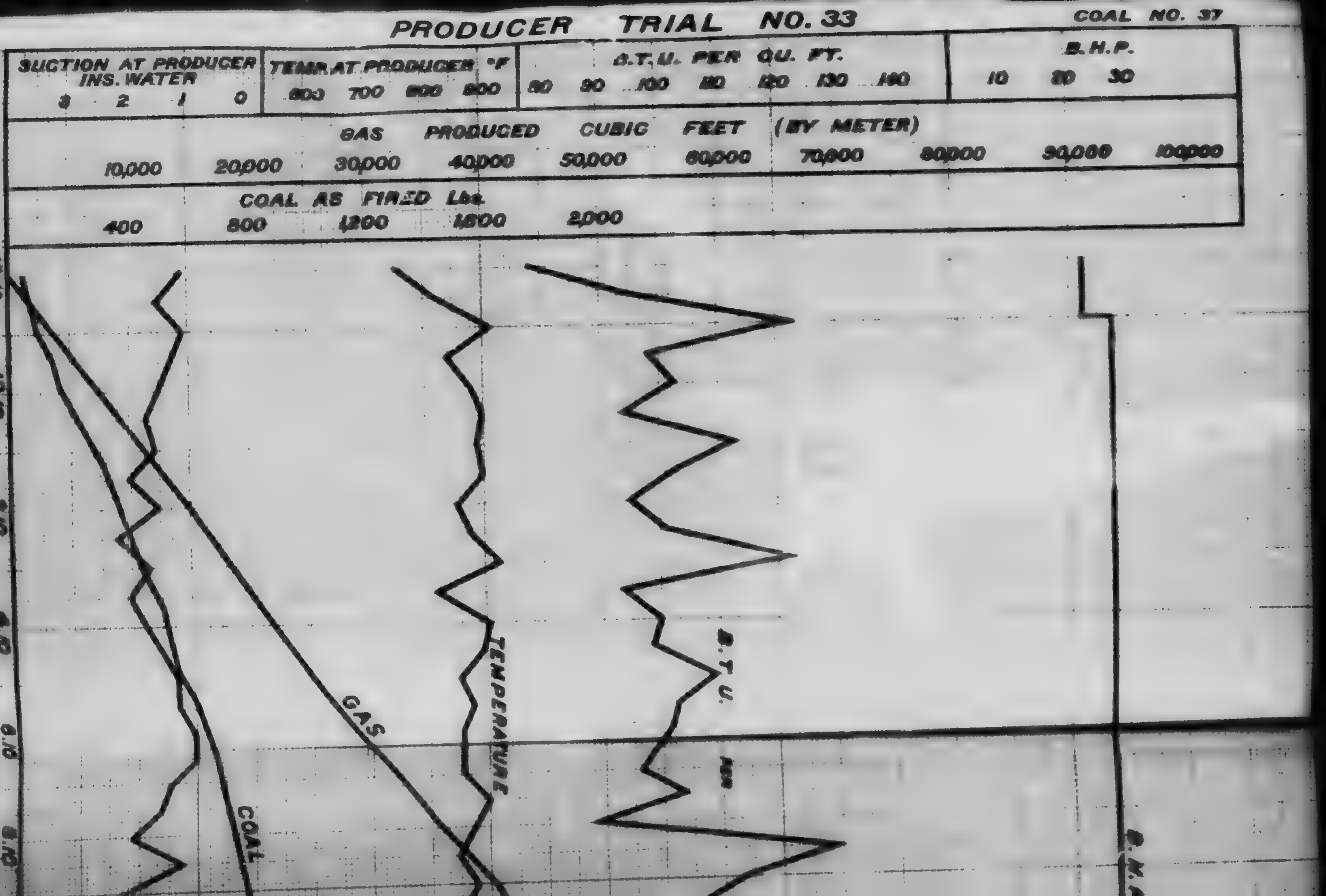
39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	60·1
41.	Combustible charged per hour	lbs.	59·2
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	52·4
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	15·1
44	Combustible charged per sq. ft. of fuel bed per hour	lbs.	14·8
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	13·1
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	5·97
47.	Gas (by meter) supplied by producer per hour	lbs.	11·80
48.	Gas (dry at 60°and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3432
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3333
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3432
51.	Calorific value of coal charged per hour	cub. ft.	3333
52.	" " gas produced per hour (lower value)	B.T.U.	776000
53.	Steam used in producer per hour	B.T.U.	334300
		lbs.	91·0

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub	55·2
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cu	56·3
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	c ft.	63·6
58.	" " " " " B.H.P. "	cu. ft.	95·0
59.	Steam used in producer per lb. coal charged	cub. ft.	132·0
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	1·5
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	19·9
62.	Efficiency of process of gas production and cleaning, based on coal charged	lbs.	351·0
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	43·2
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	38·8
65.	Thermal efficiency of engine, based on B.H.P	per cent.	32·5
66.	Over all efficiency of producer and engine plant	per cent.	19·2
67.	Calorific value of gas supplied to engine per B.H.P. per hour	per cent.	8·3
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	13,240
		B.T.U.	30,690

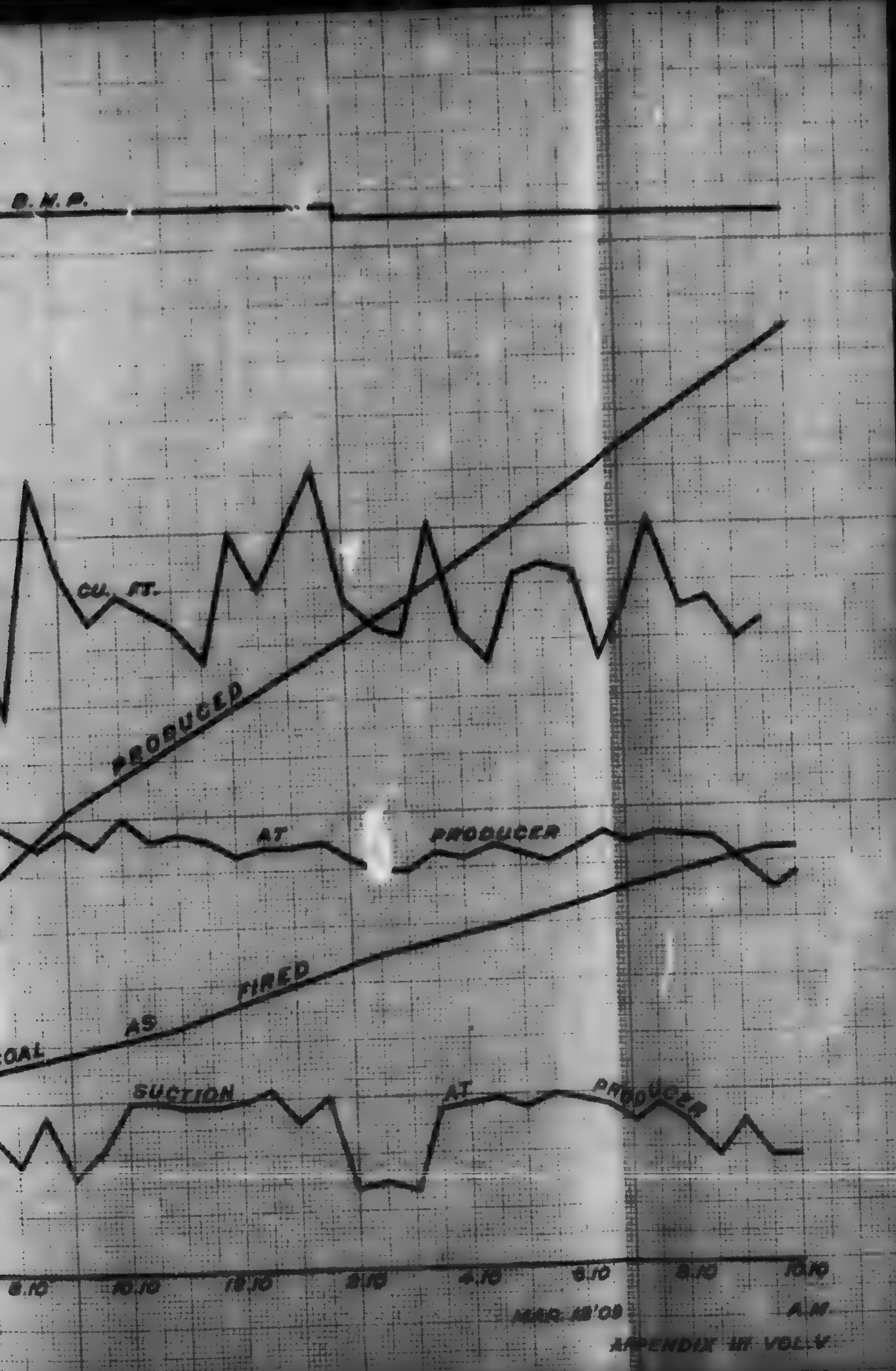
		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·39	2·34	2·07
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·66	2·60	2·3?
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·18	3·11	2·76

PRODUCER TRIAL NO. 33 COAL NO. 37



PRODUCER TRIAL NO. 33

COAL NO. 37


B.H.P.
CU. FT.
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AT PRODUCER
COAL AS FIRED
SUCTION AT PRODUCER
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MAR. 18'08
A.M.
APPENDIX III VOL.V.

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TRIAL OF No. 4 PRODUCER WITH COAL No. 12

Date—March 1 and 2, 1909. Trial Number—30.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial..	29.97 inches.
" " 8.30 p.m., March 1..	29.81 "
" end of trial..............	29.47 "
Water meter reading at 9.05 a.m., March 1	90,936 imperial gallons
" " " 6.05 a.m., " 2....	93,583
Difference, in 24 hours..	2,647 "
Brick in producer base	911 lbs.
Average level of fuel below top plate of producer.	16 inches.

TIME.			
2.50 a.m.,	March	1	Started fire with 10 lbs. of shavings, 40 lbs. of wood, and 160 lbs. of coke.
4.15 "	"	"	Producer on down-draft with fan exhausting directly to the atmosphere.
4.30 "	"	"	charged 84 lbs. of coke.
5.15 "	"	"	" 84 "
6.15 "	"	"	" 125 "
7.30 "	"	"	" 120 "
8.20 "	"	"	" 50 "
8.25 "	"	"	Started engine.
8.30 "	"	"	Trial commenced
2.00 p.m.,	"	"	Steam blown into the gas-washer.
6.15 "	"	"	" " "
11.45 "	"	"	" " "
4.10 a.m.	"	2	" " "
8.30 "	"	"	Trial completed.

Notes.

Tar removed from wet scrubber	75 lbs
Tar removed from gas washer...	3 "
Tar removed from pipes, etc......	5 "
Wet refuse removed from producer during trial	178 "
When dried this weighed.............	116
Wet refuse removed at the end of the trial..	1,336
A sample of 240 lbs. of this when dried weighed	155

The valves did not require cleaning after this trial

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 1 and 2, 1909. Trial Number—30.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m.....	12·3	0·4	0·0	11·2	2·3	12·5	61·3	26·0
10 00 "	13·0	0·4	0·2	9·6	3·3	12·8	60·7	25·9
11.00 " ...	13·1	0·4	0·0	11·4	3·3	12·7	59·1	27·4
12.00 noon....	13·4	0·4	0·1	11·1	2·6	12·6	59·8	26·4
1.00 p.m.....	12·8	0·4	0·1	10·5	3·0	13·3	59·9	26·9
2.00 "	12·6	0·4	0·0	11·9	2·6	12·0	60·5	26·5
3.00 "	12·8	0·4	0·0	11·2	2·9	14·2	58·5	28·3
4.00 "	14·7	0·3	0·0	10·5	2·9	14·9	56·7	28·3
5.00 "	12·1	0·4	0·2	10·4	3·0	13·0	60·9	26·6
6.30 "	13·2	0·3	0·2	10·2	4·1	17·4	54·6	31·9
8.00 " .	9·9	0·4	0·1	13·5	2·9	9·3	63·9	25·8
9 30 "	11·2	0·4	0·1	11·7	3·3	13·6	59·7	28·7
11.00 "	12·9	0·4	0·0	12·3	2·5	14·0	57·9	28·8
12 30 a.m..	13·1	0·3	0·1	10·4	3·8	15·3	57·0	29·6
2 30 "	11·7	0·4	0·1	11·4	2·9	15·5	58·0	29·9
4 00 "	12·8	0·3	0·1	11·8	2·3	14·4	58·4	28·5
5 30 "	12·0	0·3	0·1	10·0	4·2	16·9	56·5	31·2
7.30 "	11·6	0·5	0·1	12·3	3·6	12·9	59·0	28·9

OBSERVATIONS OF GAS METER AND B. H. P.

Date—March 1 and 2, 1909.

Trial Number—30.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.30 a.m. ..	2270110	....	N.B.O.	250	95	155	38210
9.00 " ..	2271885	1775	"	250	95	155	....
9.30 " ..	2273830	1945	"	275	115	160	45060
10.00 " ..	2275600	1770	"	275	115	160	....
10.30 " ..	2277290	1690	"	275	115	160	....
11.00 " ..	2279015	1725	"	275	115	160	....
11.30 " ..	2280475	1460	"	275	115	160	....
12.00 p.m. ..	2282320	1845	"	275	115	160	....
12.30 " ..	2284070	1750	"	275	110	165	....
1.00 " ..	2285815	1745	"	275	110	165	....
1.30 " ..	2287515	1700	"	275	110	165	....
2.00 " ..	2289245	1730	"	275	110	165	....
2.30 " ..	2291040	1795	"	275	110	165	78840
3.00 " ..	2292570	1530	"	275	110	165	....
3.30 " ..	2294280	1710	"	275	110	165	....
4.00 " ..	2295995	1715	"	275	110	165	....
4.30 " ..	2297960	1965	"	275	110	165	....
5.00 " ..	2299485	1525	"	275	110	165	....
5.30 " ..	2301160	1675	"	275	110	165	....
6.00 " ..	2302855	1695	"	275	110	165	....
6.30 " ..	2304610	1755	"	275	110	165	....
7.00 " ..	2305860	1250	"	300	118	182	....
7.30 " ..	2307550	1690	"	300	118	182	....
8.00 " ..	2309250	1700	"	300	118	182	....
8.30 " ..	2310890	1640	"	300	118	182	....
9.00 " ..	2312620	1730	"	300	118	182	....
9.30 " ..	2314145	1525	"	300	118	182	....
10.00 " ..	2315785	1640	"	300	118	182	....
10.30 " ..	2317605	1820	"	300	118	182	32371
11.00 " ..	2319400	1795	"	300	118	182	....
11.30 " ..	2321180	1780	"	300	112	188	....
12.00 a.m. ..	2322935	1755	"	300	112	188	....
12.30 " ..	2324780	....	"	300	112	188	....
1.00 " ..	2326220	1440	"	300	112	188	44000
1.30 " ..	2327880	1660	"	300	112	188	....
2.00 " ..	2329560	1680	"	300	112	188	....
2.30 " ..	2321340	1780	"	300	112	188	....
3.00 " ..	2332900	1560	"	300	112	188	....
3.30 " ..	2334680	1780	"	300	112	188	....
4.00 " ..	2336350	1670	"	300	112	188	....
4.30 " ..	2338210	1860	"	300	112	188	....
5.00 " ..	2339920	1610	"	300	112	188	....
5.30 " ..	2341710	1790	"	300	112	188	....
6.00 " ..	2343040	1330	"	300	112	188	....
6.30 " ..	2344750	1710	"	275	105	170	....
7.30 " ..	2348150	3400	"	275	105	170	....

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—March 1 and 2, 1909. **Trial Number—30.**

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.30 a.m.	54	½	5·16	12·00	1720	93·1	8.30			
9.00 "	55	½	4·54	11·25	1730	91·9				
9.30 "	56	½	4·75	10·76	1800	85·5	9.45	75	75	9.45 a m.
10.00 "	56	½	4·59	11·62	1770	98·5				
10.30 "	57	½	4·91	12·07	1740	98·6				
11.00 "	57	½	5·00	13·13	1600	103·1	11.00	50	125	
11.30 "	58	½	5·10	12·37	1600	92·1				11.00 "
12.00 p.m.	58	½	5·10	12·16	1630	91·1				
12.30 "	58	½	5·20	13·00	1620	100·1	12.30	50	175	12.30 p.m.
1.00 "	59	½	5·41	12·64	1610	92·2				
1.30 "	60	½	5·76	13·08	1710	99·0	1.20	50	225	
2.00 "	61	½	8·10	15·38	1760	101·4	2.15	50	275	2.15 "
2.30 "	62	½	6·14	12·71	1760	91·5				
3.00 "	63	½	6·70	13·90	1760	100·4				
3.30 "	63	½	6·55	14·49	1710	107·5	3.20	50	325	3.20 "
4.00 "	64	½	6·85	13·93	1670	93·6				
4.30 "	64	½	6·66	15·34	1660	114·1	4.30	75	400	4.25 "
5.00 "	65	½	6·89	13·82	1870	102·7				
5.30 "	65	½	6·55	13·59	1650	92·0	5.50	50	450	
6.00 "	65	½	6·46	14·31	1730	107·6				
6.30 "	65	½	7·39	16·63	1780	130·3	6.25	75	525	6.25 "
7.00 "	65	5/12	6·80	13·27	1715	104·8				
7.30 "	65	5/12	6·68	12·76	1715	99·3				
8.00 "	65	7/12	6·46	14·48	1650	90·0	8.05	50	575	8.05 "
8.30 "	65	7/12	6·69	14·23	1820	93·2	8.45	75	650	
9.00 "	65	½	6·71	15·51	1620	113·0				
9.30 "	65	7/12	6·60	14·95	1690	95·7	9.45	50	700	9.30 "
10.00 "	65	½	6·57	15·73	1645	119·4				
10.30 "	65	7/12	6·86	15·68	1780	106·6	10.30	50	750	
11.00 "	65	7/12	6·83	14·87	1830	99·8				
11.30 "	65	½	6·90	14·18	1600	92·3	11.30	50	800	11.30 "
12.00 a.m.	65	½								
12.30 "	65	½	6·49	16·59	1600	121·7	12.20	75	875	12.20 a.m.
1.00 "	65	½	6·90	14·33	1740	102·3				
1.30 "	65	½	6·40	13·90	1750	103·9	1.40	50	925	
2.00 "	63	½	5·70	13·07	1820	106·2				
2.30 "	63	½	5·82	13·58	1870	115·0	2.30	50	975	
3.00 "	62	½	5·76	12·76	1840	102·0				3.00 "
3.30 "	64	5/12	6·44	13·70	1600	110·5	3.20	50	1025	
4.00 "	65	5/12	6·82	14·00	1620	99·0				
4.30 "	65	5/12	7·18	14·79	1660	116·4	4.20	50	1075	
5.00 "	66	5/12	6·97	14·01	1600	107·0				
5.30 "	66	5/12	7·15	17·00	1600	149·7	5.20	75	1150	5.20 "
6.00 "	66	5/12	7·60	15·43	1600	119·2				
6.30 "	67	5/12	7·45	14·38	1640	103·2	6.30	50	1200	6.30 "
7.30 "	63	5/12	5·74	12·01	1730	103·0				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—March 1 and 2, 1909. Trial Number—30.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.30 a.m.	700	57	55	140	3·1	5·5	5·7	7·5	6·8	0·6	41	37
9.00 " .	770	57	57	144	3·7	7·4	7·6	9·0	8·9	1·1	55	51
9.30 " .	800	58	60	155	3·7	7·4	7·6	9·0	8·5	1·2	57	53
10.00 " .	790	59	60	118	3·4	6·6	6·8	6·7	6·4	0·5	59	55
10.30 " .	770	60	61	138	3·4	6·5	6·7	6·8	6·5	0·4	66	62
11.00 " .	770	60	62	135	3·5	6·8	7·0	7·4	7·0	0·4	69	65
11.30 " .	760	60	63	134	3·7	7·5	7·7	8·6	8·2	0·7	60	55
12.00 p.m.	740	60	62	131	3·5	6·3	6·5	7·0	6·5	0·4	55	53
12.30 " .	790	62	63	129	3·6	7·3	7·5	7·8	7·4	0·4	55	50
1.00 " .	770	62	62	135	3·3	5·8	6·0	6·2	5·7	0·5	54	50
1.30 " .	790	62	64	126	3·7	7·4	7·6	8·5	8·1	0·7	39	35
2.00 " .	750	63	65	138	3·3	6·0	6·2	6·5	6·2	0·4	38	34
2.30 " .	750	64	67	140	3·3	5·5	5·7	6·0	5·6	0·7	61	56
3.00 " .	780	68	68	142	3·5	6·4	6·6	7·0	6·6	1·0	68	64
3.30 " .	760	68	67	140	3·5	6·6	6·8	7·4	6·8	1·1	67	63
4.00 " .	760	68	68	140	3·4	6·4	6·6	7·5	7·1	1·2	53	47
4.30 " .	810	67	68	138	3·4	6·0	6·2	6·2	5·7	0·7	50	44
5.00 " .	770	67	68	143	3·3	5·8	6·0	6·0	5·4	0·7	57	48
5.30 " .	730	66	67	142	3·5	6·4	6·6	7·0	6·7	1·0	63	59
6.00 " .	730	66	66	135	3·3	6·3	6·5	7·0	6·6	1·0	60	56
6.30 " .	750	66	68	140	3·3	6·0	6·2	6·9	6·3	0·8	41	37
7.00 " .	700	68	68	133	3·4	6·0	6·2	7·3	6·7	0·8	59	56
7.30 " .	720	68	67	138	3·4	6·1	6·3	8·5	8·2	2·3	65	62
8.00 " .	730	67	66	139	3·5	6·6	6·8	8·1	7·7	1·3	46	42
8.30 " .	730	66	66	147	3·2	5·9	6·1	8·0	7·6	1·4	70	67
9.00 " .	770	65	67	140	3·3	6·4	6·6	8·5	8·2	1·7	58	55
9.30 " .	750	64	66	145	3·1	5·0	5·2	7·4	7·3	1·0	61	58
10.00 " .	830	64	65	137	3·5	6·9	7·1	9·0	8·6	1·1	61	55
10.30 " .	800	64	66	138	3·6	6·9	7·1	9·0	8·8	1·4	59	55
11.00 " .	800	64	66	140	3·5	6·4	6·6	8·0	7·6	0·9	45	41
11.30 " .	820	64	66	137	3·9	7·0	7·2	8·1	7·7	1·1	44	40
12.00 a.m.	820	68	66	133	3·5	6·1	6·3	7·0	6·5	0·7	66	63
12.30 " .	790	67	65	135	3·5	6·5	6·7	7·7	7·2	0·7	75	71
1.00 " .	780	67	64	133	3·5	6·0	6·2	7·7	7·3	0·7	70	65
1.30 " .	780	66	63	134	3·6	6·2	6·4	7·7	7·4	0·8	72	68
2.00 " .	800	66	62	134	3·5	6·0	6·2	8·0	7·5	0·7	70	66
2.30 " .	790	63	62	135	3·5	6·0	6·2	7·2	6·9	0·7	82	78
3.00 " .	800	62	62	134	3·4	6·3	6·5	8·3	7·5	0·7	83	79
3.30 " .	780	62	66	130	3·5	6·2	6·4	8·0	7·5	0·7	58	55
4.00 " .	800	62	68	134	3·5	7·0	7·2	8·8	8·5	0·7	70	67
4.30 " .	800	68	68	138	3·6	7·1	7·3	9·2	8·7	0·7	77	73
5.00 " .	780	70	70	140	3·6	6·9	7·1	7·7	7·5	0·5	73	70
5.30 " .	780	70	70	141	3·6	6·7	6·4	8·8	8·4	1·6	76	73
6.00 " .	770	70	70	143	3·5	6·8	7·0	9·5	9·0	0·7	80	76
6.30 " .	770	68	70	139	3·6	7·0	7·2	10·0	9·5	0·8	51	48
7.00 " .	770	69	70	140	3·5	6·9	7·1	9·9	9·4	0·8	49	45
7.30 " .	780	64	62	131	3·5	5·5	5·7	8·0	7·5	1·0	46	42
8.00 " .	780	63	62	133	3·5	5·6	5·8	8·4	8·0	0·9	47	43
8.30 " .	780	62	62	134	3·6	5·7	5·9	8·6	8·2	0·9	45	42

PRODUCER TRIAL No. 30.

Date—March 1-2, 1909. Producer No. 4, at McGill University.

Time of lighting up—2.50 a.m. Trial commenced 8.30 a.m., March 1; ended 8.30 a.m., March 2.

Duration of trial—24 hours. Kind of fuel—No. 12 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Campbell, Nicolls, Stansfield.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1200
2.	Moisture in coal as charged	per cent.	3·6
3.	Calorific value of coal as charged, per lb	B.T.U.	13180
4.	" " of dry coal per lb	B.T.U.	13680
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 53·2; volatile matter, 35·4; ash, 7·8; moisture, 3·6	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 45·0; volatile matter, 7·2	Total per cent.	52·2
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43·7

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	81320
9.	Average temperature of gas leaving producer	°F.	732
10.	" " " at meter	°F.	64·5
11.	Average temperature of air in producer house	°F.	65·0
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	105·7
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	108·3
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	98·0
14.	Average barometric pressure	lbs. sq in.	14·58
15.	" suction at producer	ins. of water	0·85
16.	" suction at exhauster	ins. of water	7·8
17.	" pressure of gas at meter	ins. of water	4·9

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2220
19.	" water used in scrubber and gas washer	lbs.	36020
20.	" tar extracted in scrubber and gas washer	lbs.	83
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		321700
24.	Average explosions per minute		103·6
25.	Average effective load on brake	lbs.	174·2
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	70·3

28.

Notes.

Fire poked at: 9.45, 11.00 a.m.; 12.30, 2.15, 3.20, 4.25, 6.25, 8.05, 9.30, 11.30 p.m.; 12.20, 3.00, 5.20, 6.30 a.m.

Refuse removed at: 9.45 a.m.; 4.25, 6.05, 7.30, 9.30 p.m.; 12.20, 2.13, 3.20, 4.50, 5.20, 6.30 a.m

Behaviour of coal: Works well.

Average time between poking: 1 hour and 43 minutes.

Clinker: No record of any difficulty due to clinker.

Tar: Fairly large amount removed from wet scrubber.

State of engine valves at end of trial: Did not need cleaning.

Valves last cleaned: Feb. 23, 1909.

29.

ANALYSIS OF DRY COAL.

Hydrogen	5·1%
Carbon	74·9%
Nitrogen	1·4%
Oxygen	9·4%
Sulphur	2·5%
Total carbon contained by dry coal charged	865·0 lbs.

30.

ANALYSIS OF GAS BY VOLUME.

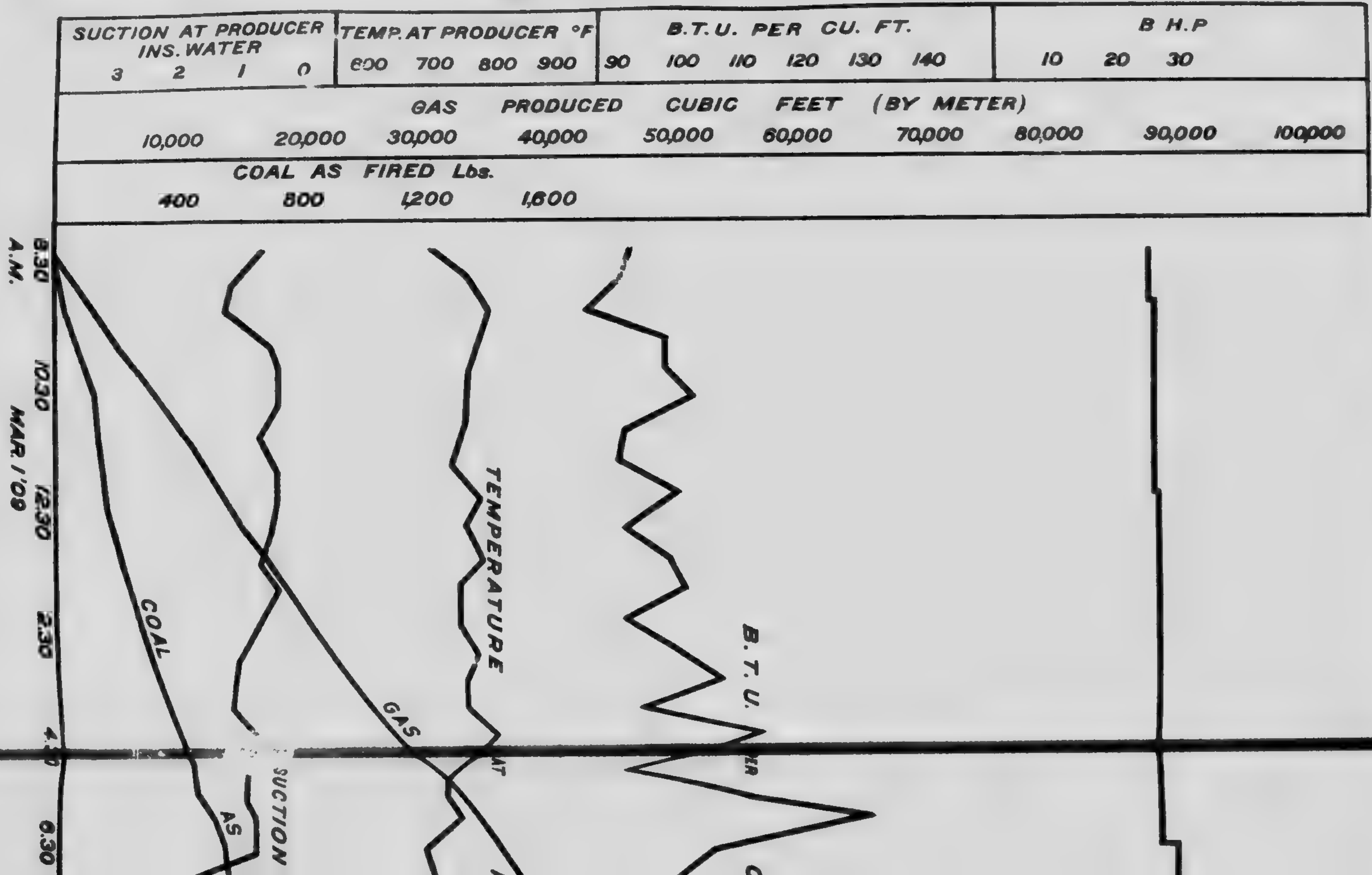
Carbon dioxide	12·5%
Oxygen	0·4%
Carbon monoxide	11·2%
Hydrogen	13·7%
Methane	3·1%
Ethylene	0·1%
Nitrogen	59·0%

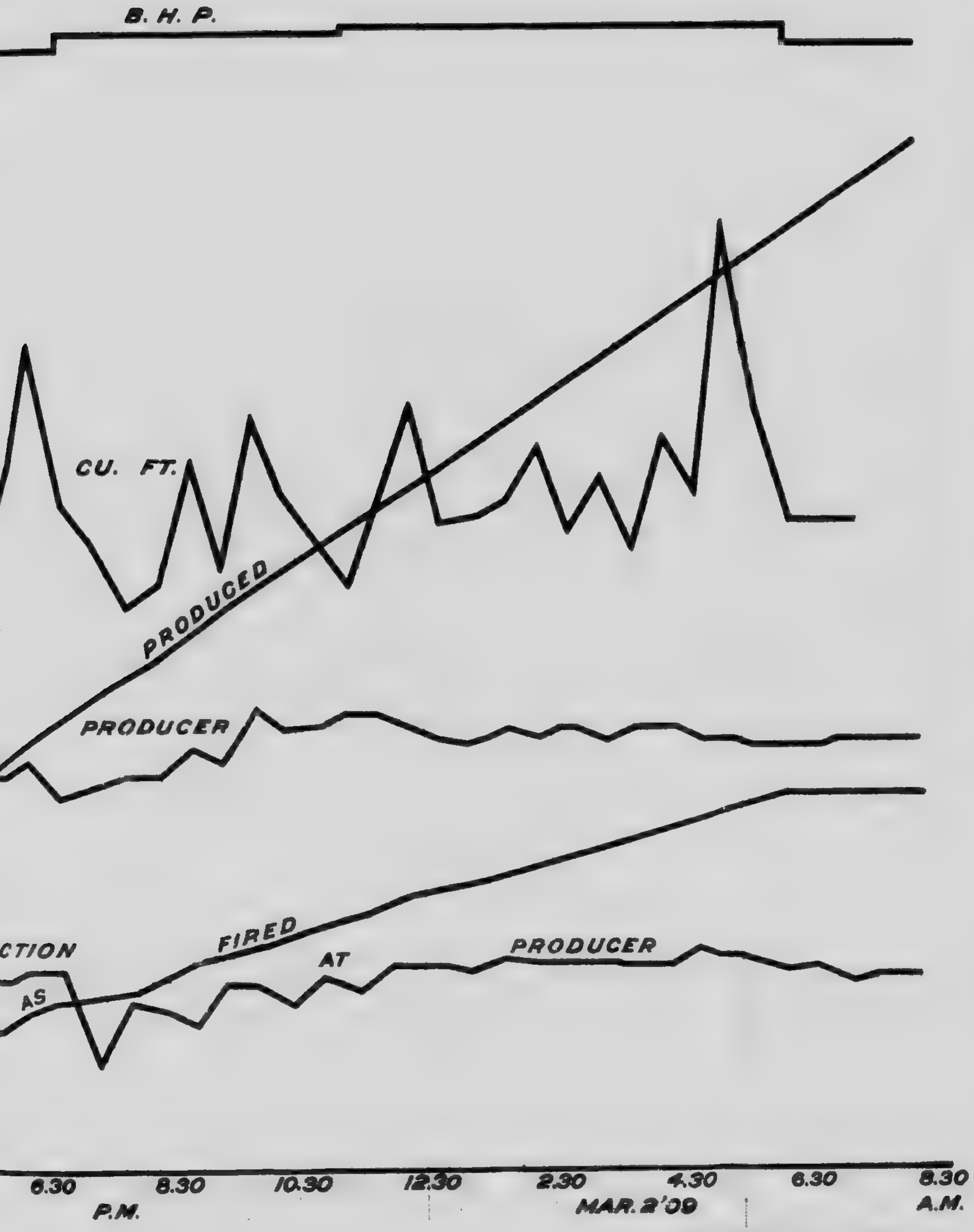
PRODUCER TRIAL NO. 30

COAL. NO. 12

PRODUCER TRIAL NO. 30

COAL NO. 12





APPENDIX III VOL.V

Remarks.

This coal works very well, giving off a gas of uniform though not of high calorific value. Suction of producer very low. Engine ran steadily during the trial.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1156
32.	Combustible charged during trial	lbs.	1063
33.	Average B.H.P. of engine during trial	H.P.	28·4
34.	“ indicated H.P. of engine during trial	H.P.	41·7
35.	“ H.P. taken by exhauster and gas washer	H.P.	4·0
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	28·4
37.	“ “ corresponding to total gas produced	H.P.	28·4
38.	“ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	24·4

Hourly Quantities.

39.	Coal charged per hour	lbs.	50·0
40.	Dry coal charged per hour	lbs.	48·1
41.	Combustible charged per hour	lbs.	44·3
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	12·5
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	12·0
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	11·1
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	7·04
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·71
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3387
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3300
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3387
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3300
51.	Calorific value of coal charged per hour	B.T.U.	659500
52.	“ “ gas produced per hour (lower value)	B.T.U.	323400
53.	Steam used in producer per hour	lbs.	92·5

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft	66·0
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	68·6
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	74·5
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	79·2
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	116·2
59.	Steam used in producer per lb. coal charged	lbs.	1·85
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	30·0
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	443·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	49·1
63	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	42·1
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	34·1
65.	Thermal efficiency of engine, based on B.H.P.	per cent.	22·3
66.	Over all efficiency of producer and engine plant	per cent.	10·97
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	11390
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	23200

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·76	1·69	1·56
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·05	1·97	1·82
71	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·53	2·44	2·24

INVERNESS COAL FIELD

INVERNESS CO., NOVA SCOTIA

TRIAL OF No. 4 PRODUCER WITH COAL No. 15

Date—January 17 and 18, 1909. Trial Number—21.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	30·11 inches.
" " end of trial	30·20 "
Water meter reading at 9 a.m., January 17	60,685 imperial gallons.
" " " 8 a.m., " 18	63,536 " "
Difference, in 23 hours	2,851 " "
Brick in producer base	1,000 lbs.
Average level of coal below top plate of producer	22 inches.

TIME				
3.00	a.m.,	Jan.	17	Fire started with 30 lbs. of shavings, 40 lbs. of wood, 130 lbs. of coke.
5.00	"	"	"	Charged 125 lbs. of coal.
6.00	"	"	"	" 75 "
6.00	"	"	"	Down-draft with fan exhausting directly to atmosphere.
7.00	"	"	"	Charged 75 lbs. of coal.
7.35	"	"	"	" 50 "
8.30	"	"	"	" 75 "
8.30	"	"	"	Down-draft with blower.
8.35	"	"	"	Started the engine.
8.45	"	"	"	Trial commenced.
6.25	p.m.,	"	"	Gas diverted through the sawdust scrubber, while the gas-washer was being cleaned out with steam.
11.30	"	"	"	Gas-washer blown out with steam.
2.45	a.m.,	"	18	" " "
7.00	"	"	"	" " "
8.45	"	"	"	Trial finished.

At the end of the trial the gas washer was found to be full of tar and the inlet pipe to the wet scrubber was somewhat clogged. The gas-washer was run at about 1,900 revolutions per minute during this trial, an increase in speed of 300 revolutions per minute above that of the previous trials.

Tar removed from the wet scrubber	63	lbs.
Tar removed from the gas washer	7	"
1042 lbs. of wet refuse removed from the producer during the trial.		
200 lbs. of this when dried weighed	152½	"
1144 lbs. of wet refuse removed after the trial		
206 lbs. of this when dried weighed	153	"

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 17 and 18, 1909. Trial Number—21.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.10 a.m.	10·1	0·9	0·1	10·1	3·6	5·7	69·5	19·5
10.10 "	10·1	0·5	0·4	11·9	1·8	8·7	66·6	22·8
11.10 "	10·8	0·4	0·0	13·7	2·2	10·3	62·6	26·2
12.00 noon....	9·1	0·8	0·0	14·2	3·0	6·9	66·0	24·1
1.00 p.m.....	11·5	0·6	0·6	12·0	3·5	8·8	63·0	24·9
2.00 "	8·9	0·4	0·3	4	2·6	8·2	65·0	25·7
3.00 "	9·9	0·5	1·0	13·0	2·2	8·1	65·3	24·3
4.00 "	10·2	1·1	0·2	11·3	3·5	11·4	62·3	26·4
5.00 "	9·9	0·7	0·5	11·4	1·3	13·0	63·2	26·2
6.00 "	10·0	0·8	0·2	13·7	2·6	9·3	63·4	25·8
7.00 "	9·2	0·9	0·3	13·5	1·8	6·9	67·4	22·5
8.00 "	13·5	0·9	0·3	11·0	2·6	15·2	56·5	29·1
9.00 "	13·1	0·5	0·2	11·6	2·2	11·5	60·9	25·5
10.00 "	14·2	0·7	0·1	10·5	2·6	13·1	58·8	26·3
11.00 "	10·3	0·9	0·7	11·2	6·1	18·3	52·5	36·3
12.00 midnight	10·0	0·8	0·5	10·9	3·1	12·9	61·8	27·4
1.00 a.m.....	10·3	0·8	0·4	12·0	3·5	11·1	61·9	27·0
2.00 "	11·3	0·9	0·3	11·8	3·0	10·0	62·7	25·1
3.00 "	10·0	0·4	0·3	12·8	2·7	13·6	60·2	29·4
4.00 "	11·8	0·8	0·5	12·1	4·4	10·4	60·0	27·4
5.00 "	11·9	1·0	0·5	11·3	2·1	12·8	60·4	26·7
6.00 "	11·9	0·9	0·5	10·8	3·4	13·1	59·4	27·8
7.00 "	12·7	0·9	0·3	10·1	2·5	11·6	61·9	24·5
8.00 "	13·5	1·0	0·3	10·1	2·1	14·2	58·8	26·7

OBSERVATIONS OF GAS METER AND B. H. P.

Date—January 17 and 18, 1909 Trial Number—21.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.45 a.m. ..	1548610	......	N.B.O.	275	88	187	11300
9.15 “ ..	1550126	1515	“	275	88	187	....
9.45 “ ..	1551985	1760	“	275	88	187	....
10.15 “ ..	1553830	1845	“	275	88	187	....
10.45 “ ..	1555540	1710	“	275	88	187	....
11.15 “ ..	1557260	1720	“	275	88	187	....
11.45 “ ..	....	......	....	300	105	195	31000
12.15 p.m. ..	1560800	2540	“	300	105	195	....
12.45 “ ..	1562600	1800	“	275	95	180	37460
1.15 “ ..	1564670	1010	“	275	95	180	....
1.45 “ ..	1566290	1620	“	275	95	180	....
2.15 “ ..	1568090	1800	“	275	95	180	....
2.45 “ ..	1570890	1800	“	275	95	180	....
3.15 “ ..	1571360	1470	“	275	95	180	....
3.45 “ ..	1573140	1780	“	275	95	180	....
4.15 “ ..	1574870	1730	“	275	95	180	....
4.45 “ ..	1576365	1495	“	275	95	180	....
5.15 “ ..	1578150	1795	“	275	95	180	....
5.45 “ ..	1579980	1830	“	275	95	180	....
6.15 “ ..	1581490	1510	“	275	95	180	....
6.45 “ ..	1583270	1780	“	275	95	180	....
7.15 “ ..	1585050	1780	“	275	95	180	....
7.45 “ ..	1586520	1470	“	272	98	178	....
8.15 “ ..	1587890	1370	“	272	98	178	....
8.45 “ ..	1589360	1470	“	272	98	178	....
9.15 “ ..	1590890	1530	“	272	98	178	....
9.45 “ ..	1592455	1565	“	272	98	178	96725
10.15 “ ..	1594010	1555	“	272	98	178	....
10.45 “ ..	1595580	1570	“	272	98	178	....
11.15 “ ..	1597160	1580	“	272	98	178	....
11.45 “	1598460	1360	“	250	73	177	09800
12.15 a.m.	1599980	1570	“	250	73	177	....
12.45 “ .	1601450	1470	“	250	73	177	....
1.15 “ .	1603000	1550	“	200	52	148	19680
1.45 “ ..	1604680	1680	“	200	52	148	....
2.15 “ ..	1606320	1640	“	250	65	185	22180
2.45 “ .	1607720	1400	“	250	65	185	....
3.15 “ .	1609120	0400	“	250	65	185	....
4.15 “	1611940	2820	“	250	65	185	....
5.15 “	1614870	2930	“	250	65	185	....
6.45 “ .	1619090	4220	“	250	65	185	....
7.15 “ .	1620500	1410	“	250	65	185	....
7.45 “	1622030	1530	“	250	65	185	....
8.15 “ ..	1623550	1520	“	250	65	185	....
8.45 “ ..	1625260	1710	“	250	65	185	69260

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED

Date—January 17 and 18, 1909. **Trial Number—21.**

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.45 a.m.	45	$\frac{1}{2}$	4·42	14·77	1760	145·0	8.50 a.m.	50	50	
9.15 "	46	$\frac{1}{2}$	4·77	12·60	1720	114·7	9.25 "	50	100	9.25 a.m.
9.45 "	46	$\frac{1}{2}$	4·00	12·61	1660	113·4				
10.15 "	46	$\frac{1}{2}$	3·70	11·02	1905	110·4	10.05 "	50	150	
10.45 "	47	$\frac{1}{2}$	3·75	12·07	1880	123·9	10.40 "	50	200	
11.15 "	48	$\frac{5}{12}$	3·72	11·18	1600	113·5	11.15 "	50	250	
11.45 "	48	$\frac{5}{12}$	3·83	11·01	1710	116·7				
12.15 p.m.	48	$\frac{5}{12}$	3·80	10·36	1900	118·5	12.00 p.m.	50	300	
12.45 "	49	$\frac{5}{12}$	3·93	9·87	1935	103·7	12.45 "	50	350	
1.15 "	51	$\frac{1}{2}$	3·99	13·35	1090	125·3	1.20 "	50	400	
1.45 "	51	$\frac{1}{2}$	4.16	11·74	1750	105·0	1.50 "	50	450	
2.15 "	51	$\frac{1}{2}$	4·40	12·25	1830	113·8				
2.45 "	52	$\frac{1}{2}$	4·49	13·95	1815	135·3	2.40 "	50	500	
3.15 "	53	$\frac{5}{12}$	4·66	13·17	1600	129·4	3.10 "	50	550	
3.45 "	54	$\frac{5}{12}$	4·51	13·77	1660	114·5	3.35 "	50	600	
4.15 "	54	$\frac{1}{2}$	4·70	12·51	2000	125·3	4.10 "	50	650	
4 45 "	55	$\frac{5}{12}$	4·64	12 40	1680	123·9	4.40 "	50	700	
5.15 "	54	$\frac{5}{12}$	4·22	10·89	1765	112·0	5.25 "	50	750	5.15 p.m.
5.45 "	54	$\frac{5}{12}$	4·42	11·27	1760	114·6	5.55 "	50	800	
6.15 "	54	$\frac{5}{12}$	4·45	11·30	1810	117·8	6·35 "	50	850	
6.45 "										
7.15 "	55	$\frac{5}{12}$	4·40	12·75	1770	140·5	7.15 "	75	925	7.10 "
7.45 "	55	$\frac{5}{12}$	4·49	12·57	1755	135·0	7 40 "	50	975	
8.15 "	55	$\frac{5}{12}$	4·21	12·41	1745	136·0	8.10 "	50	1025	
8.45 "	55	$\frac{5}{12}$	4·04	11·71	1700	124·0				
9.15 "	55	$\frac{5}{12}$	4·37	12·48	1750	134·7				
9.45 "	55	$\frac{5}{12}$	4·10	11·27	1745	119·0				
10.15 "	55	$\frac{5}{12}$	4·18	11·46	1755	121·5	10.10 "	100	1125	
10.45 "	55	$\frac{5}{12}$	4·15	11·71	1765	126·8				
11.15 "	55	$\frac{5}{12}$	4·15	11·74	1955	141·0	11.15 "	50	1175	11.10 "
11.45 "	55	$\frac{5}{12}$	4·57	11·55	1980	131·5	11.45 "	50	1225	
12.15 a.m.	55	$\frac{5}{12}$	4·45	12·43	1870	141·8	12.05 a.m.	50	1275	12.00 a.m.
12.45 "										12 25 "
1.15 "	55	$\frac{5}{12}$	4·14	10·61	1850	113·7	1.25 "	75	1350	
1.45 "	55	$\frac{5}{12}$	4·15	10·95	1830	118·8				
2.15 "	56	$\frac{5}{12}$	4·20	11·56	1970	137·8	2·05	100	1450	
2 45 "	56	$\frac{5}{12}$	4·56	11·03	1930	118·8				
3.15 "	55	$\frac{5}{12}$	4·29	13·38	1910	163·8	3.15 "	75	1525	3·15 "
3 45 "	55	$\frac{5}{12}$	3·81	11·33	1850	132·4	3 55 "	50	1575	
4 15 "	55	$\frac{5}{12}$	3·87	11·24	1880	131·6	4.30 "	50	1625	4 20 "
4.45 "	55	$\frac{5}{12}$	4·32	11·03	1890	120·5				
5 15 "	55	$\frac{5}{12}$	4·25	11·02	1870	120·4	5.20 "	75	1700	5 15 "
5 45 "	55	$\frac{5}{12}$	4·05	11·58	1870	133·7	5.50 "	50	1750	
6.15 "	55	$\frac{5}{12}$	4·31	12·44	1890	146·0				6 15 "
6.45 "	55	$\frac{5}{12}$	4·32	11·35	2000	133·6	6.30 "	50	1800	
7.15 "	55	$\frac{5}{12}$	4·78	10·91	1905	110·8	7.15 "	50	1850	
7.45 "	55	$\frac{5}{12}$	5·16	11·90	1910	122·4	7.30 "	25	1875	
8.15 "							8.00 "	75	1950	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—January 17 and 18, 1909. **Trial Number—21.**

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.45 a.m..	720	52	49	75	3·9	6·4	6·6	9·4	8·5	2·6	33	30
9.15 " .	740	52	50	172	3·7	6·1	6·3	9·7	8·7	2·3	64	61
9.45 " .	820	54	52	163	3·8	6·5	6·7	8·7	8·4	0·8	66	63
10.15 " .	800	54	50	145	4·0	6·5	6·7	9·9	9·3	1·0	71	68
10.45 " .	790	54	50	131	3·6	5·4	5·6	8·9	8·5	0·9	61	57
11.15 " .	770	54	52	136	3·6	5·7	5·9	9·1	8·2	1·0	71	68
11 45 " .	760	55	53	136	3·7	5·4	5·6	9·3	8·3	0·8	70	67
12.15 p.m.	780	56	53	143	3·7	6·0	6·2	10·5	9·8	0·7	72	70
12.45 " .	880	56	52	132	4·0	6·1	6·3	11·5	10·3	1·6	72	70
1.15 " .	810	57	54	137	3·9	6·5	6·7	11·4	10·4	1·3	59	56
1.45 " .	760	57	52	139	3·8	6·0	6·2	11·2	10·1	1·3	72	70
2 15 " .	760	58	56	143	3·8	6·3	6·5	11·5	10·1	1·6	64	63
2.45 " .	750	57	56	147	3·5	4·7	4·9	7·8	7·0	1·6	59	56
3 15 " .	740	57	56	147	3·5	5·4	5·6	10·3	8·8	1·8	63	61
3.45 " .	800	61	57	145	3·9	6·0	6·2	11·5	10·8	2·0	68	66
4.15 " .	800	61	57	149	3·6	4·9	5·1	9·6	9·0	0·6	68	65
4 45 " .	800	62	57	149	3·3	4·5	4·7	10·2	9·6	0·9	72	70
5.15 " .	760	62	56	147	3·9	6·2	6·4	13·6	12·4	0·9	65	63
5 45 " .	790	62	56	149	3·6	5·5	5·7	10·4	10·0	0·8	64	62
6.15 " .	750	62	55	149	3·4	5·3	5·5	11·0	10·2	0·5	70	67
6.45 " .	750	62	55	129	3·4	5·4	5·6	15·0	. .	0·6	57	55
7.15 "	810	62	57	147	3·7	5·5	5·7	12·0	11·7	0·6	32	28
7 45 " .	800	62	57	150	3·2	4·4	4·6	7·4	6·9	0·3	37	32
8.15 " .	800	61	57	148	3·2	4·4	4·6	9·0	8·6	0·3	59	55
8 45 " .	800	60	57	149	3·3	4·9	5·1	9·0	8·4	0·3	48	43
9 15 " .	820	60	56	146	3·2	4·7	4·9	11·4	10·8	0·4	46	42
9 45 " .	810	59	57	140	3·3	4·8	5·0	10·8	10·2	0·4	62	58
10 15 " .	800	60	57	142	3·4	5·2	5·4	11·7	11·0	0·5	65	62
10 45 " .	760	59	57	137	3·4	5·4	5·6	12·6	12·0	0·5	55	53
11 15 "	780	59	57	140	3·5	5·2	5·4	12·6	12·0	2·0	65	62
11 45 " .	720	58	58	129	3·2	4·6	4·8	10·6	10·0	1·5	68	65
12 15 a.m.	740	62	57	142	3·2	4·7	4·9	10·8	10·2	3·1	51	48
12 45 "	760	61	57	130	3·5	5·4	5·6	11·2	11·0	2·9	58	56
1 15 "	780	60	56	137	3·3	5·3	5·5	12·3	12·0	2·7	53	50
1 45 "	790	60	57	130	3·6	4·8	5·0	11·6	11·2	3·3	41	39
2 15 " .	800	60	58	138	3·4	5·3	5·5	12·0	11·7	3·6	45	44
2 45 "	780	60	57	142	3·4	5·3	5·5	12·0	11·6	2·8	47	45
3 15 "	780	59	57	142	3·4	5·2	5·4	11·8	11·4	2·7	38	36
4 15 "	780	60	56	129	3·3	4·8	5·0	11·9	11·5	2·5	25	23
5 15 "	760	58	57	135	3·3	5·0	5·2	11·0	10·8	2·2	33	31
6 45 "	760	58	57	144	3·2	4·8	5·0	12·8	12·4	2·0	26	25
7 15 "	740	56	57	129	3·4	4·3	4·5	11·7	11·6	2·0	33	31
7 45 "	780	61	62	139	3·5	4·3	4·5	12·7	12·4	2·3	40	37
8 15 "	800	61	62	141	3·4	5·6	5·2	14·6	14·0	2·5	52	49
8 45 "	800	65	63	141	3·6	5·3	5·5	14·9	14·3	2·4	50	48

PRODUCER TRIAL No. 21.

Date—January 17-18, 1909. Producer No. 4, at McGill University.

Time of lighting up—3 a.m. Trial commenced 8.45 a.m., January 17; ended 8.45 a.m., January 18.

Duration of trial—24 hours. Kind of fuel—No. 15 coal

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Nicolls, Campbell, Stansfield.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1950
2.	Moisture in coal as charged	per cent.	2·8
3.	Calorific value of coal as charged, per lb	B.T.U.	11440
4.	" " of dry coal per lb	B.T.U.	11770
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 49·2; volatile matter, 35·3; ash, 12·7; moisture, 2·8	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 57·5; volatile matter, 5·4 ...Total	per cent.	62·9
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	38

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	76650
9.	Average temperature of gas leaving producer	°F.	780
10.	" " " at meter	°F.	59
11.	Average temperature of air in producer house	°F.	56
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	125·2
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	125·0
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	116·1
14.	Average barometric pressure	lbs. sq in.	14·77
15.	" suction at producer	ins. of water	1·53
16.	" suction at exhauster	ins. of water	11·1
17.	" pressure of gas at meter	ins. of water	4·42

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	1920
19.	" water used in scrubber and gas washer	lbs.	35510
20.	" tar extracted in scrubber and gas washer	lbs.	70
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		315920
24.	Average explosions per minute		102
25.	Average effective load on brake	lbs.	181
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	68·2

28. **Notes.**

Fire poked at: 9.25 a.m., 5.15 p.m.; 7.10, 12.00 p.m.; 3.15, 4.20, 5.15, 6.15 a.m.

Refuse removed at: 10 20 a.m.; 12.10, 1.45, 2.30, 3.30, 4.36, 5.50, 5 15, 7.10, 7.50, 8.10, 9.55, 10.50 p.m., 12.00, 1.15, 3.15, 5.45 a.m

Behaviour of coal: Good, free in fire.

Average time between poking: 3 hours.

Clinker: None.

Tar: In fairly large quantity.

State of engine valves at end of trial: Dirty.

Valves last cleaned: Jan. 13, 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·2%
Carbon	63·7%
Nitrogen	0·8%
Oxygen	8·8%
Sulphur	7·9%
Total carbon contained by dry coal charged	1207·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

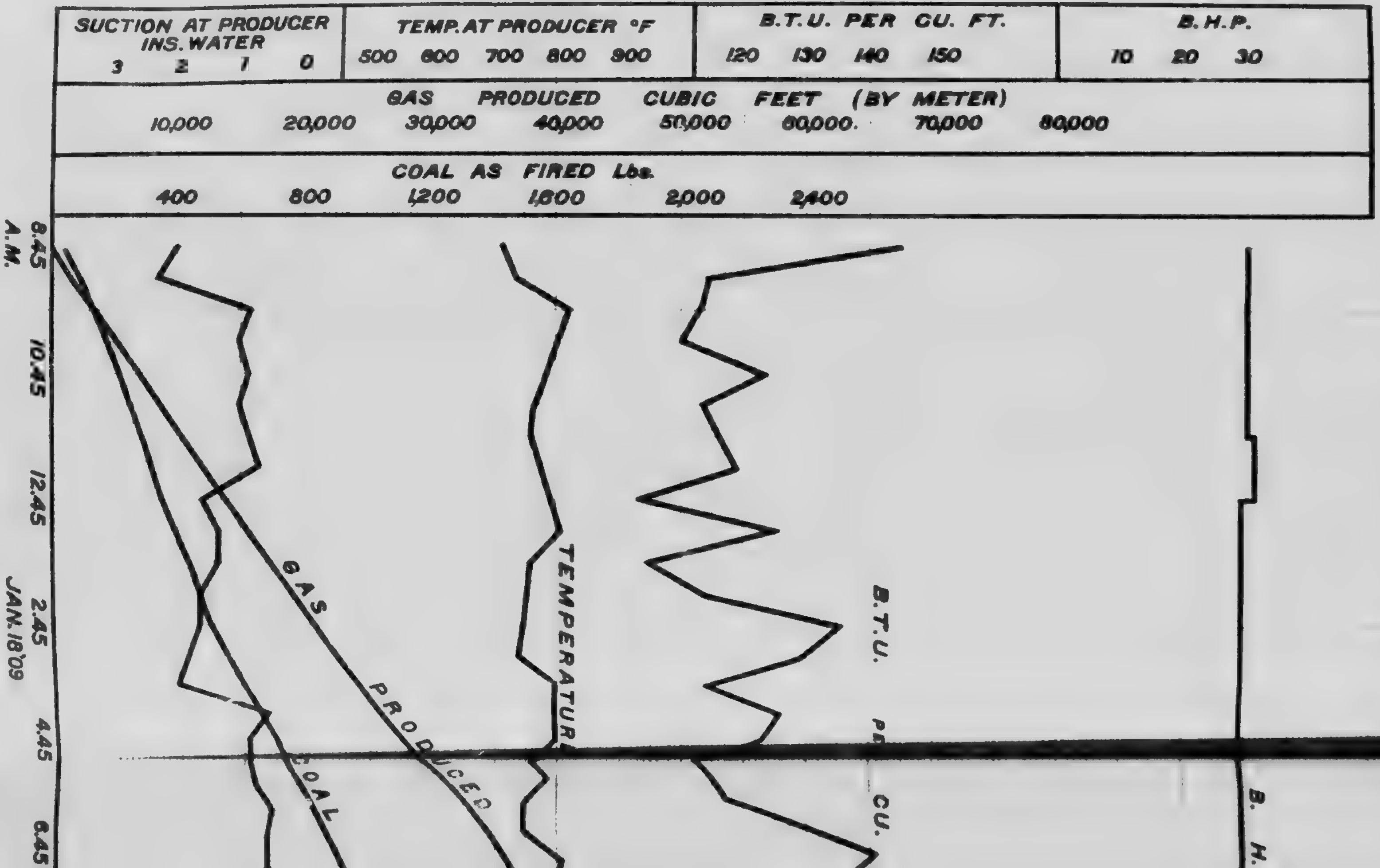
Carbon dioxide	11·0%
Oxygen	0·8%
Carbon monoxide	11·9%
Hydrogen	11·0%
Methane	2·8%
Ethylene	0·4%
Nitrogen	62·1%

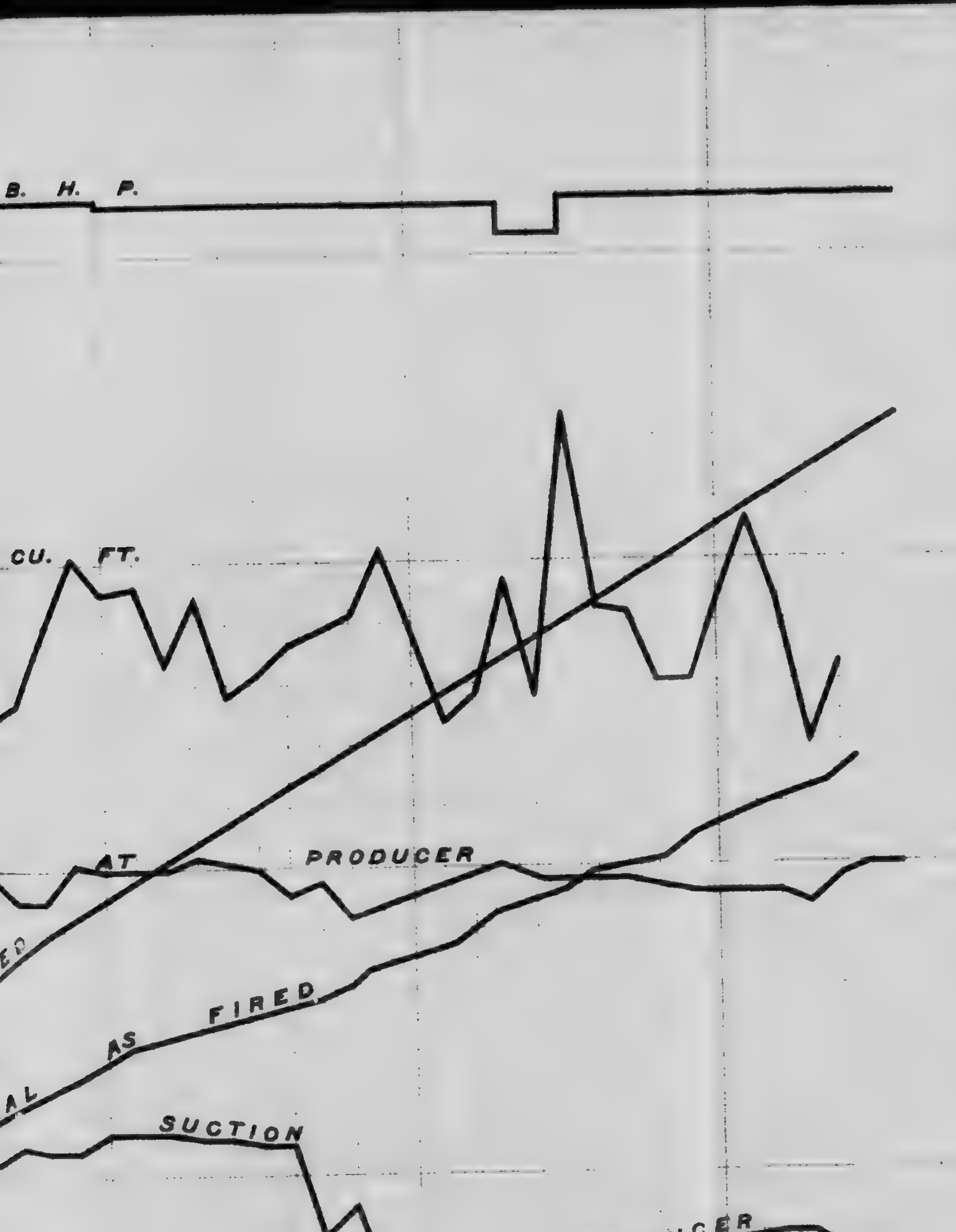
PRODUCER TRIAL NO. 21

COAL NO. 15

PRODUCER TRIAL NO. 21

COAL NO. 15





APPENDIX III VOL.V

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1. T
2. M
3. C
4.
5. P

6. C

7. A

8. Th
9. A
10.
11. A
12a. A

12b. A

13. A

14. A
15.
16.
17.

18. I'o
19.
20.
21 Av
22

23. Th
24. Av
25. Av
26. E
27. Av

28.

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12.00, 1.
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V

29.

Remarks.

This coal only fair for producer work owing to the large quantity of dirt and tar. No trouble from clinker.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1895
32.	Combustible charged during trial	lbs.	1646
33.	Average B.H.P. of engine during trial	H.P.	29·25
34.	" indicated H.P. of engine during trial	H.P.	39·8
35.	" H.P. taken by exhauster and gas washer	H.P.	4·0
36.	" B H.P. while gas consumption of engine was taken	H.P.	29·25
37.	" " corresponding to total gas produced	H.P.	29·25
38.	" " " " " " and available for outside use, allowing for power used	H.P.	25·25

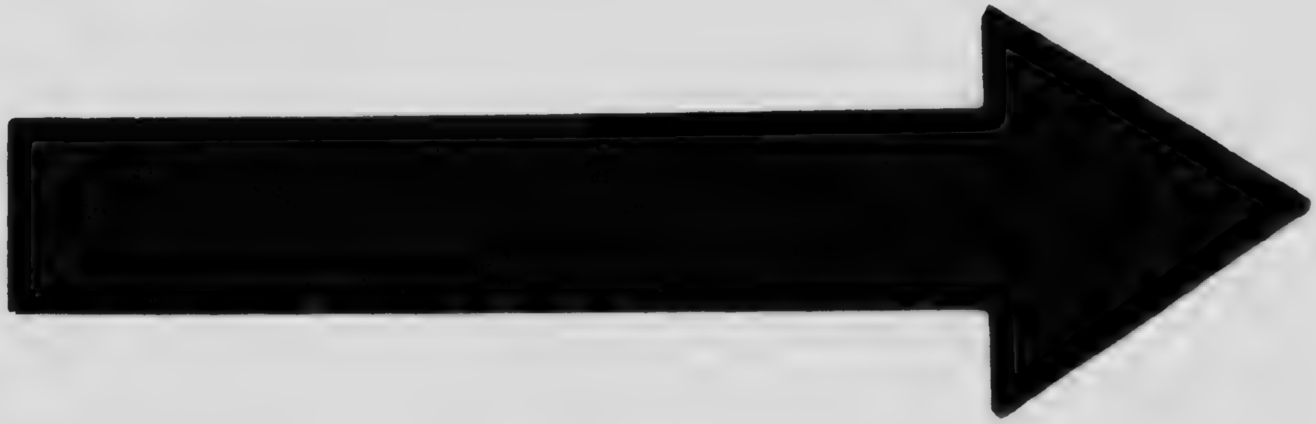
Hourly Quantities.

39.	Coal charged per hour	lbs.	81·25
40.	Dry coal charged per hour	lbs.	79·0
41.	Combustible charged per hour	lbs.	68·62
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	20·31
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	19·75
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	17·13
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	11·12
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·67
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3194
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3196
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3194
50	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3196
51.	Calorific value of coal charged per hour	B.T.U.	930000
52.	" " gas produced per hour (lower value)	B.T.U.	371000
53.	Steam used in producer per hour	lbs.	80

Economic Results.

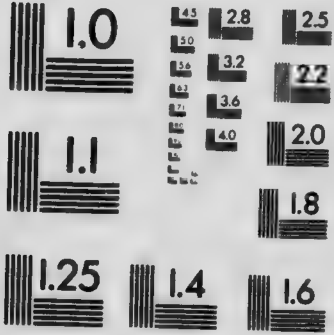
54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	39·4
55	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	40·4
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	46·6
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	80·3
58.	" " " " " " B.H.P. "	cub. ft.	109
59.	Steam used in producer per lb. coal charged	lbs.	0·99
60	Water used in scrubber and gas washer per lb. coal charged	lbs.	1822
61	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	464·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	39·8
63	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	34·4
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	30·1
65.	Thermal efficiency of engine, based on B.H.P	per cent.	20·1
66.	Over all efficiency of producer and engine plant	per cent.	8·03
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U	12650
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	31703

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·78	2·70	2·35
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	3·22	3·13	2·72
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·68	3·58	3·10



MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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PICTOU COAL FIELD

PICTOU CO., NOVA SCOTIA

TRIAL OF No. 4 PRODUCER WITH COAL No. 2

Date—January 28 and 29, 1909. Trial Number—24.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·50 inches.
" " 7 p.m., January 28	29·54 "
" " end of trial	29·52 "
Water meter reading at 9.00 a.m., January 28	72,200 imperial gallons.
" " " 6.30 a.m., " 29	75,370 " "
Difference, in 21½ hours	3,170 " "
Brick in producer base	900 lbs.
Average level of fuel below top plate of producer	18 inches

TIME.				
3.30	a.m ,	Jan.	28	Fire started with 10 lbs. of shavings, 30 lbs. of wood, 135 lbs. of coke.
6.00	"	"	"	Down-draft with the fan exhausting directly to the atmosphere.
6.00	"	"	"	Charged 75 lbs. of coal.
6.50	"	"	"	" 50 "
7.00	"	"	"	" 50 "
7.30	"	"	"	" 50 "
8.00	"	"	"	" 75 "
8.00	"	"	"	Down-draft with blower.
8.20	"	"	"	Charged 50 lbs. of coal.
8.30	"	"	"	Started engine.
8.35	"	"	"	Trial commenced.
8.35	"	"	"	Trial finished.

The engine valves were found in good condition at the end of the run.
7 lbs. of tar removed from the wet scrubber.
348 lbs. of wet refuse removed from the producer during the trial.
156 lbs. of this when dried weighed .... 100 lbs.
1157 lbs. of wet refuse removed after the trial.
210 lbs. of this when dried weighed .... 122 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 28 and 29, 1909. Trial Number—24.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m.	10·3	1·3	0·4	9·9	3·7	8·8	65·6	22·8
10.00 "	9·4	1·1	0·0	10·6	3·7	10·1	65·7	23·8
11.00 "	12·1	1·0	0·2	11·8	2·5	12·3	60·1	26·8
12.00 noon....	12·5	2·3	0·2	11·1	2·5	9·8	61·6	23·6
1.00 p.m....	10·5	1·0	0·5	10·3	4·3	16·6	56·8	31·7
2.00 "	12·5	1·0	0·1	12·8	2·3	12·2	59·1	27·4
3.00 "	11·8	1·1	0·1	12·3	3·0	12·1	59·0	27·5
4.00 "	11·6	1·0	0·4	10·7	3·2	12·3	60·8	26·6
5.00 "	12·4	1·0	0·3	11·3	2·1	12·9	60·0	26·6
7.05 "	12·0	1·1	0·1	11·9	1·7	11·2	62·0	24·9
8.35 "	12·6	1·0	0·0	11·8	2·1	10·4	62·1	24·3
10.05 " ...	12·2	0·8	0·2	12·0	2·0	12·0	60·8	26·2
11.35 "	12·4	0·8	0·1	11·3	2·1	11·9	61·4	25·4
1.05 a.m....	11·0	0·8	0·2	12·0	2·6	12·2	61·2	27·0
2.35 "	13·0	0·9	0·2	11·5	1·7	11·9	60·8	25·3
4.05 "	11·7	0·8	0·3	13·0	2·0	12·6	59·6	27·9
5.35 "	12·5	0·9	0·2	12·5	1·7	13·7	58·5	28·1
7.05 " ...	11·2	0·9	0·3	10·3	3·1	13·7	60·5	27·4
7.50 " ...	12·3	0·7	0·1	7·5	1·8	6·4	71·2	15·8

OBSERVATIONS OF GAS METER AND B.H.P

Date—January 28 and 29, 1909. Trial Number—24.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to the atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.35 a.m. .	1802880	....	N.B.O.	275	100	175	60470
9.05 " ..	1804710	1830	"	275	100	175	....
9.35 " ..	1806660	1950	"	275	100	175	67010
10.05 " ..	1808665	2005	"	275	100	175	....
10.35 " ..	1810670	2005	"	275	100	175	.....
11.05 " ..	1812575	1905	"	275	100	175	.. ..
11.35 " ..	1814555	1980	"	275	100	175	80310
12.05 p.m. .	1816460	1905	"	275	100	175	....
12.35 "	1818375	1915	"	250	85	165	...
1.05 " ..	1820425	2050	"	250	85	165	....
1.35 " ..	1822420	1995	"	250	90	160	....
2.05 " ..	1824165	1745	"	250	90	160	....
2.35 " ..	1825975	1810	"	250	85	165	....
3.05 " ..	1827860	1885	"	250	85	165	....
3.35 " ..	1829725	1865	"	250	85	165	....
4.05 " ..	1831580	1855	"	250	85	165	....
4.35 " ..	1833450	1870	"	250	85	165	....
5.05 " ..	1835150	1700	"	250	85	165	....
5.35 " ..	1837030	1880	"	250	85	165	20270
6.05 " ..	1838725	1695	"	250	85	165	....
6.35 " ..	1840390	1665	"	250	85	165	....
7.05 " ..	1842125	1735	"	250	85	165	....
7.35 " ..	1843985	1860	"	250	85	165	....
8.05 " ..	1845700	1715	"	250	85	165	....
8.35 " ..	1847600	1900	"	250	85	165	....
9.05 " ..	1849475	1875	"	250	85	165	....
9.35 " ..	1851390	1915	"	250	85	165	....
10.05 " ..	1853160	1770	"	250	85	165	....
10.35 " ..	1855060	1900	"	250	85	165	53590
11.05 " ..	1856840	1780	"	250	85	165	....
11.35 " ..	1858680	1840	"	250	85	165	....
12.05 a.m.	1860620	1940	"	250	85	165	....
12.35 " ..	1862535	1915	"	250	85	165	....
1.05 " ..	1864280	1745	"	250	85	165	....
1.35 " ..	1866050	1770	"	250	85	165	73730
2.05 " ..	1868075	2025	"	250	85	165	....
2.35 " ..	1869920	1845	"	250	85	165	..
3.05 " ..	1871840	1920	"	250	85	165	....
3.35 " ..	1873880	2040	"	[illegible]	85	165	....
4.05 " ..	1875900	2020	"	250	85	165	....
4.35 " ..	1877760	1860	"	250	85	165	....
5.05 " ..	1879500	[illegible]	"	250	85	165	....
5.35 " ..	1881370	[illegible]	"	250	85	165	....
6.05 " ..	1883170	[illegible]	"	250	85	165	....
6.35 " ..	1885005	[illegible]	"	250	85	165	....
7.05 " ..	1886920	1915	"	250	85	165	....
7.35 " ..	1888830	1910	"	250	85	165	....
8.05 " ..	1880730	1900	"	250	85	165	....
8.35 " ..	1892565	1835	"	250	85	165	19107

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—January 28 and 29, 1909. Trial Number 24.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
9.05 a.m.	57	1/3	7·79	13·81	1600	114·2	9.10 a.m.	50	50	9.05
9.25 "	57	1/3	5·55	10·2[illegible]	1930	107·0	9 30 "	25	75	
10.05 "	57	1/2	5·15	12·24	1780	100·0	9 55 "	50	125	
10.35 "	57	5/12	4·84	11·32	1620	106·0				
11 05 "	57	5/12	4·80	11·60	1625	105·0	10 55 "	50	175	
11.35 "	57	5/12	4·94	11·53	1630	102·1				
12.05 p.m.	58	5/12	5·14	11·81	1600	101·3	12 05 p.m.	25	200	
12 35 "	58	1/2	5·34	12·03	1780	94·2				
1.05 "	58	1/2	5·41	14·00	1600	109·6	1 00 "	50	250	1 00
1.35 "	58	1/2	5·72	14·62	1600	112·6				
2.05 "	58	7/12	5·41	14·35	1760	106·8	2 55 "	50	300	
12.35 "	58	1/2	5·13	13·23	1600	102·7				
3 05 "	59	1/2	5·12	13·51	1610	107·0				
3 35 "	60	1/2	5·06	12·88	1610	99·5				
4.05 "	60	1/2	5·21	13·17	1620	102·3	4 00	50	350	4 00
4.35 "	60	1/2	5·29	12·47	1775	101·0				
5.05 "	60	5/12	5·24	11·09	1795	99·6				
5 35 "	60	1/2	5·20	13·28	1650	104·6	5 20 "	50	400	5.20
6.05 "	59	1/2	6·15	13·57	1290	105·2				
6.35 "	59	5/12	6·29	13·13	1600	104·0	6.20 "	50	450	
7.05 "	62	5/12	6·50	12·42	1600	90·0				
7.35 "	62	1/2	6·65	14·36	1710	104·4	7.20 "	50	500	
8.05 "	62	1/2	6·60	13·61	1740	96·5				
8.35 "	62	1/2	6·57	13·09	1730	89·2	8 55 "	100	600	
9.05 "	62	1/2	6·83	14·18	1760	115·1				
9.35 "	63	1/2	7·00	14·00	1730	95·8				
10.05 "	63	1/2	6·94	13·53	1790	93·3	10 20 "	50		
10 35 "	63	5/12	6·93	13·54	1600	100·4				
11.05 "	63	5/12	6·92	14·17	1600	110·1	11 20 "	50		
11.35 "	64	1/2	7·17	13·75	1780	92·6	11.55 "	50		
12 05 a.m.	64	1/2	7·52	15·43	1760	110·2				
12 35 "	64	1/2	7·77	14·86	1765	99·2				
1 05 "	64	1/2	7·71	14·13	1775	90·2	1 05 a.m.	50	800	
1.35 "	65	1/2	7·90	14·61	1800	95·6				1.40
2.05 "	65	1/2	7·48	13·78	1900	95·0	2 10 "	50	850	
2.35 "	64	5/12	7·41	13·27	1650	91·8				
3.05 "	64	5/12	7·34	13·01	1690	91·1				
3 35 "	64	5/12	7·75	13·27	1730	90·5				
4.05 "	65	5/12	7·74	13·29	1720	90·0	4 00 "	50	900	
4.35 "	65	1/3	7·87	13·41	1600	105·4				
5 05 "	65	1/3	8·02	12·99	1690	94·5	5.05 "	50	950	5.00
5.35 "	65	1/3	7·97	13·21	1600	99·6				
6 05 "	65	1/3	7·98	12·58	1615	88·3	6 05 "	50	1000	
6 35 "	65	1/3	7·98	12·78	1660	94·7				
7 05 "	66	1/3	8·03	11·87	1800	82·2	7 05 "	75	1075	7 05
7 35 "	66	1/3	8·13	11·92	1830	82·3	7 35 "	50	1125	7 35
							8 05 "	50	1175	8 05

OBSERVATIONS OF TEMPERATURES AND PRESSURES

Date—January 28 and 29, 1909. Trial Number—24.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 35 a.m.	720	61	55	150	3·8	6·7	6·9	8·9	8·2	2·3	71	68
9 05 "	780	61	57	185	3·7	6·8	7·0	9·2	8·6	1·6	65	62
9 35 "	800	62	58	149	3·8	7·1	7·3	9·8	8·9	1·7	70	66
10 05 "	820	62	59	137	3·8	7·1	7·3	10·3	9·4	1·8	71	68
10.35 "	810	58	59	131	3·5	6·4	6·6	9·1	8·2	1·3	72	68
11 05 "	860	63	58	131	3·7	6·9	7·1	10·4	9·5	1·5	63	58
11.35 "	860	63	60	130	3·8	7·0	7·2	10·2	9·3	1·5	68	63
12 05 p.m.	860	63	61	132	3·6	6·6	6·8	9·2	8·3	1·4	59	53
12.35 "	870	63	60	135	3·8	7·3	7·5	10·8	9·3	1·5	67	62
1.05 "	900	63	62	128	3·7	7·1	7·3	10·6	9·3	1·9	60	48
1.35 "	910	64	62	131	3·6	6·5	6·7	9·6	8·2	1·6	58	46
2 05 "	860	64	63	134	3·6	6·6	6·8	9·0	7·8	1·1	68	63
2.35 "	870	64	61	139	3·6	6·6	6·8	9·1	7·8	1·3	73	68
3 05 "	890	64	60	136	3·9	7·1	7·3	10·2	8·8	1·4	64	59
3.35 "	880	64	60	135	3·6	6·3	6·5	8·6	7·3	1·1	73	68
4.05 "	900	63	60	131	3·7	6·9	7·1	9·4	8·0	1·0	65	60
4.35 "	890	62	60	138	3·9	6·9	7·1	9·4	8·2	1·0	62	57
5.05 "	850	62	60	138	3·5	6·5	6·7	9·0	7·4	1·0	65	60
5 35 "	870	62	58	138	3·7	6·5	6·7	9·5	7·2	1·0	64	59
6 05 "	840	63	62	142	3·6	6·2	6·5	8·7	7·4	1·0	49	45
6 35 "	830	64	63	140	3·6	6·0	6·2	8·5	6·8	1·0	41	37
7.05 "	830	64	63	136	3·6	6·5	6·7	9·8	8·1	1·0	38	34
7.35 "	850	64	64	137	3·6	6·4	6·6	8·6	7·3	0·8	39	34
8.05 "	850	64	64	135	3·7	6·7	6·9	9·3	8·1	0·9	47	42
8 35 "	870	65	64	133	3·8	6·0	6·2	9·8	8·3	6 8	44	40
9 05 "	890	65	65	138	3·8	6·8	7·0	9·9	8·6	0·8	42	39
9.35 "	890	65	64	135	3·7	7·4	7·6	8·8	7·8	0·9	67	63
10.05 "	880	66	65	133	3·8	6·9	7·1	9·8	8·7	0·8	65	60
10.35 "	890	66	65	132	3·7	6·5	6·7	8·9	8·0	0·8	53	49
11.05 "	880	66	65	133	3·6	6·6	6·8	9·2	8·1	0·9	59	55
11 35 "	880	66	65	134	3.7	6·5	6·7	9·0	8·0	0·9	65	60
12 05 a.m.	890	66	65	133	3·7	6·9	7 1	9·4	8·2	1·0	70	65
12 35 "	880	66	66	137	3·8	6·9	7·1	9·5	8·2	0·9	52	47
1.05 "	850	66	66	137	3·5	5·9	6·1	8·0	6·7	0·8	74	69
1 35 "	860	67	67	137	3·7	6·7	6·9	9·3	7·9	0·9	64	60
2 05 "	880	67	67	137	3·9	7·5	7·7	10·7	9·2	0·9	61	56
2 35 "	860	67	67	138	3·6	6·5	6·7	8·9	7·5	0·8	80	75
3.05 "	880	66	65	134	3·8	7·2	7·8	10·1	8·6	0·9	61	56
3 35 "	880	66	66	138	3·9	6·7	6·9	10·2	8·6	0·8	48	45
4 05 "	870	66	66	140	3·9	6·6	6·8	10·0	8·7	0·8	54	50
4 35 "	870	66	66	135	3·7	6·5	6·7	9·0	8·6	0·8	80	77
5 05 "	880	66	66	132	3·9	6·6	6·4	9·9	8·4	0·9	76	72
6 35 "	870	68	67	136	3·7	6·6	6·8	8·3	6·7	0·8	73	70
6.05 "	900	68	67	136	3·6	6·5	6·7	9·9	8·4	0·8	70	65
6.35 "	920	68	67	133	3·8	6·9	7·1	9·5	7·7	0·8	60	55
7.05 "	920	68	67	128	3·6	6·8	7·0	9·8	8·2	0·9	60	55
7 35 "	1000	68	66	128	3·9	7·3	7·5	10·8	9·5	1·2	60	56
8.05 "	1020	67	65	120	3·7	6·8	7·0	9·3	8·0	1·1	64	60
8 35 "	1040	67	65	130	3·9	6·8	7·0	9·8	8·7	1·3	55	50

PRODUCER TRIAL No. 24.

Date—January 28-29, 1909. Producer No. 4, at McGill University.

Time of lighting up—3.30 a.m. Trial commenced 8.35 a.m., January 28; ended 8.35 a.m., January 29.

Duration of trial—24 hours. Kind of fuel—No. 2 coal.

Observers and staff during trial—Killam, Cameron, Gardner.

Computers—Killam, Cameron.

Chemists—Stansfield, Nicolls, Campbell.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1175
2.	Moisture in coal as charged	per cent.	1·9
3.	Calorific value of coal as charged, per lb	B.T.U.	12920
4.	" " of dry coal per lb	B.T.U.	13180
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 56·3; volatile matter, 30·9; ash, 10·9; moisture, 1·9	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 37·8; volatile matter, 4·3	Total per cent.	42·1
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	42

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	89685
9.	Average temperature of gas leaving producer	°F.	875
10.	" " " at meter	°F.	65
11.	Average temperature of air in producer house	°F.	63
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	99·3
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	102·7
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	93·6
14.	Average barometric pressure	lbs. sq in.	14·45
15.	" suction at producer	ins. of water	1·1
16.	" suction at exhauster	ins. of water	9·5
17.	" pressure of gas at meter	ins. of water	5·15

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2590
19.	" water used in scrubber and gas washer	lbs.	41160
20.	" tar extracted in scrubber and gas washer	lbs.	7·0
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		317274
24.	Average explosions per minute		102·4
25.	Average effective load on brake	lbs.	166·5
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	69·6

28. **Notes.**

Fire poked at: 9.05 a.m.; 1.00, 4.00, 5.20, 10.15 p.m.; 1.40, 5.00, 7.05, 7.35, 80.5 a.m.
Refuse removed at: 4.05, 8 55, 11.35 p.m.; 1.40 a.m.
Behaviour of coal: Easily worked in producer, very little poking required.
Average time between poking: 3 hrs. 24 mins.
Clinker: No trouble.
Tar: No trouble.
State of engine valves at end of trial: Good condition.
Valves last cleaned: Jan. 20., 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·5%
Carbon	74·2%
Nitrogen	2·1%
Oxygen	7·9%
Sulphur	0·9%
Total carbon contained by dry coal charged	855·0 lbs.

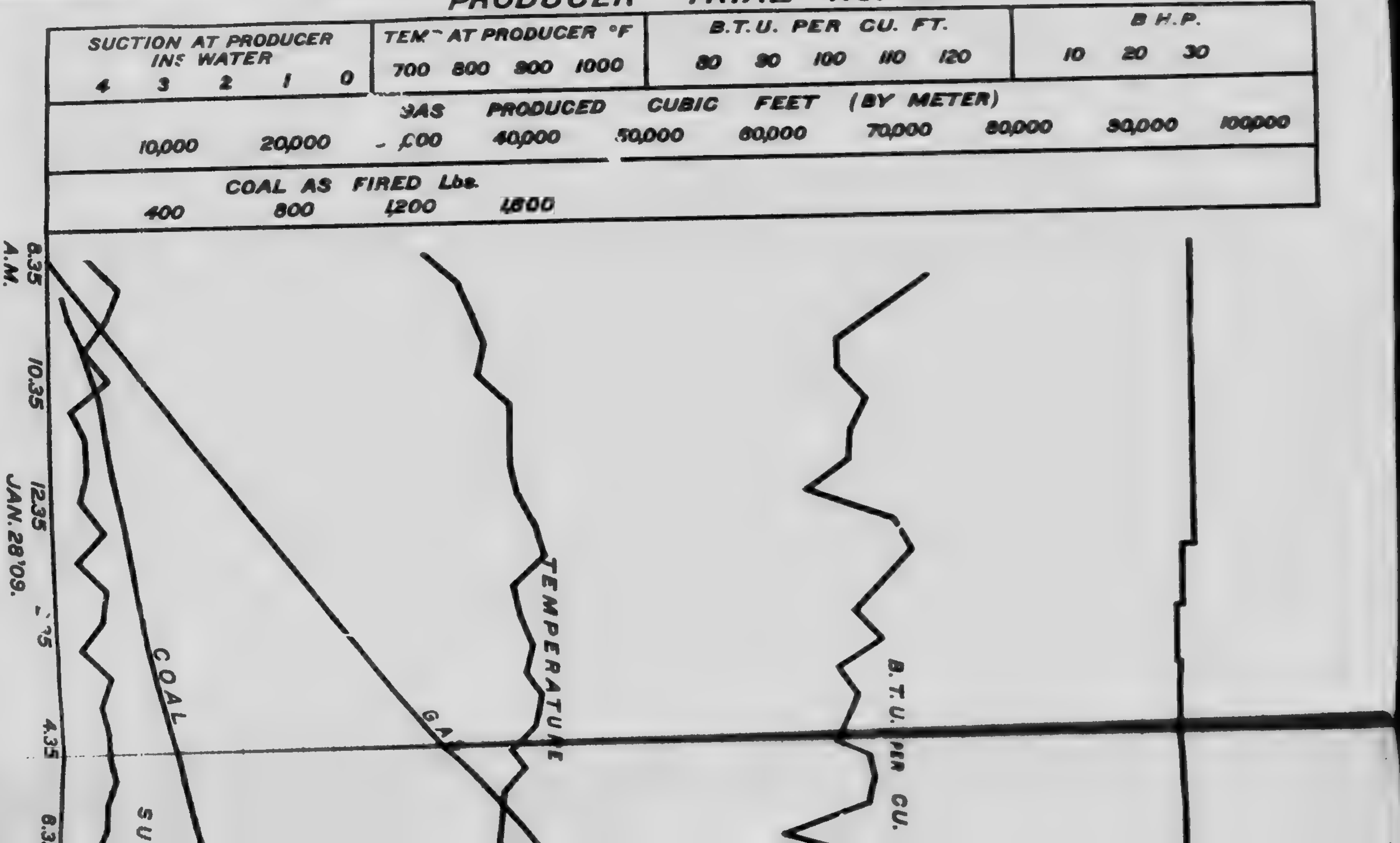
30. ANALYSIS OF GAS BY VOLUME.

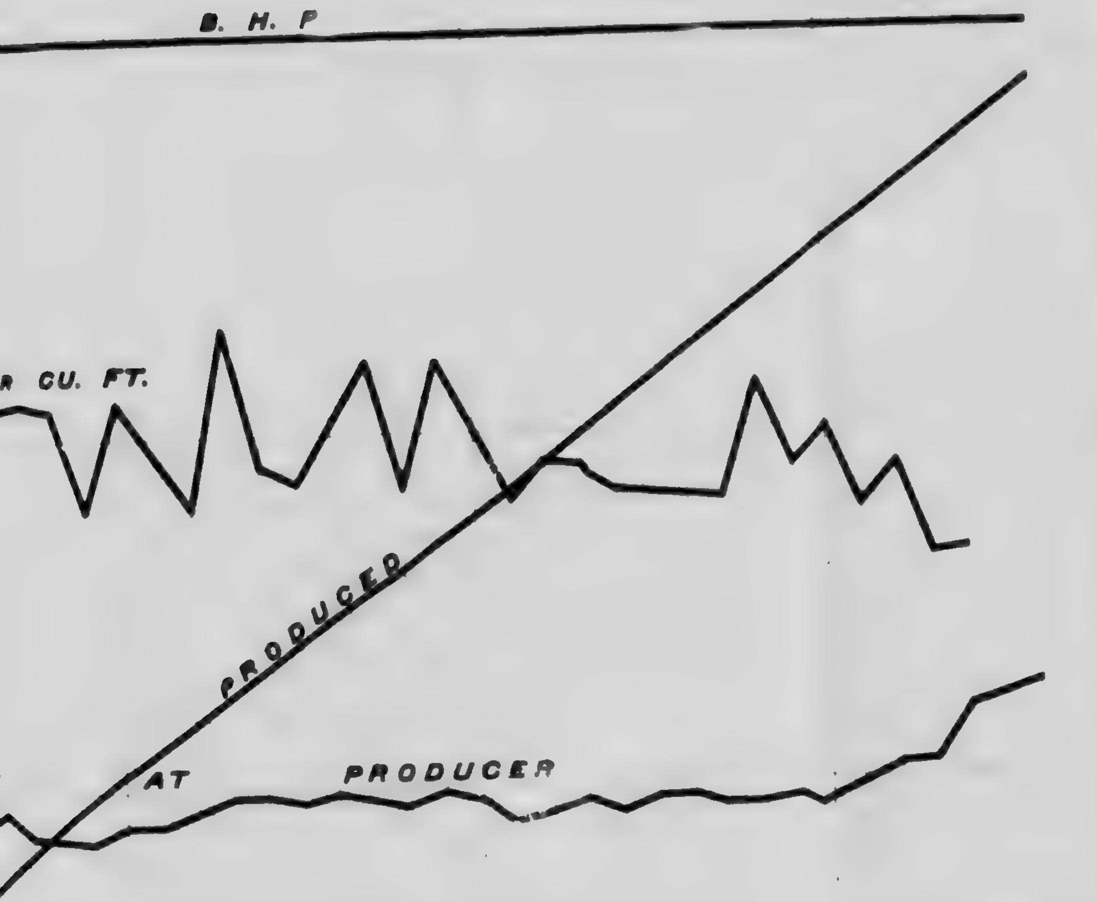
Carbon dioxide	11·8%
Oxygen	1·1%
Carbon monoxide	11·2%
Hydrogen	12·1%
Methane	2·6%
Ethylene	0·2%
Nitrogen	61·0%

PRODUCER TRIAL NO. 24 COAL NO. 2.

PRODUCER TRIAL NO. 24

COAL NO. 2.





APPENDIX III VOL.V

Remarks.

This coal seems very easily worked in producer giving no trouble as to clinker or tar and requiring very little poking. Gas was uniform but of low calorific value.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1152
32.	Combustible charged during trial	lbs.	1024
33.	Average B.H.P. of engine during trial	H.P.	26·77
34.	“ indicated H.P. of engine during trial	H.P.	36·11
35.	“ H.P. taken by exhauster and gas washer	H.P.	4·0
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	26·77
37.	“ “ corresponding to total gas produced	H.P.	26·77
38.	“ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	22·77

Hourly Quantities.

39.	Coal charged per hour	lbs.	49·0
40.	Dry coal charged per hour	lbs.	48·1
41.	Combustible charged per hour	lbs.	42·7
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	12·2
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	12·0
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	10·7
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	7·32
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	13·9
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3735
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3605
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3735
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3605
51.	Calorific value of coal charged per hour	B.T.U.	633000
52.	“ “ gas produced per hour (lower value)	B.T.U.	337000
53.	Steam used in producer per hour	lbs.	108

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	73·7
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	75·0
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	84·5
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	99·8
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	134·8
59.	Steam used in producer per lb. coal charged	lbs.	2·20
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	35·0
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	459·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	53·3
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	45·3
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	35·2
65	Thermal efficiency of engine, based on B.H.P	per cent.	20·2
66.	Mechanical efficiency of engine	per cent.	72·8
67.	Over all efficiency of producer and engine plant	per cent.	10·7
68.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12600
69.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	23650

		Coal as charged.	Dry coal.	Combustible.
70.	Pounds per hour charged into producer per B.H.P. developed by engine	1·83	1·80	1·60
71.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·15	2·11	1·88
72.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·77	2·72	2·42

TRIAL OF No. 4 PRODUCER WITH COAL No. 8

Date—February 15 and 16, 1909. Trial Number—26.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·92 inches.
" " 11.35 p.m., Feb. 15	29·97 "
" " end of trial	29·84 "
Water meter reading at 12 a.m., Feb. 15	79,585 imperial gallons.
" " " 11 a.m., " 16	82,730 " "
Difference, in 23 hours	3,145 " "
Brick in producer base	900 lbs.
Average level of fuel below top plate of the producer	17 inches.

TIME.				
7.30	a.m.,	Feb.	15	Started fire with 10 lbs. of shavings, 30 lbs. of wood, 135 lbs. of coke.
8.15	"	"	"	Down-draft with fan exhausting directly to the atmosphere.
8.30	"	"	"	Charged 50 lbs. of coal.
9.00	"	"	"	" 75 "
9 45	"	"	"	" 75 "
10.30	"	"	"	" 100 "
11.15	"	"	"	Down-draft with blower.
11.25	"	"	"	Charged 50 lbs. of coal.
11.35	"	"	"	Started engine.
11.35	"	"	"	Started trial.
10.00	p.m.,	"	"	Steam blown into gas-washer.
1.45	"	"	"	" "
3.40	a.m.,	"	16	Engine running light on gas-holder while pipes were being cleaned.
3.55	"	"	"	
7.40	"	"	"	" " " " "
7.55				
11 35	"	"	"	Trial finished.

The engine valves were examined at the end of the run and found to be clean, and were not cleaned.

Tar removed from the wet scrubber	54 lbs
Tar removed from the gas washer	1 lb.
1133 lbs. of wet refuse removed from the producer during the trial;	
A sample of 343 lbs. of this when dried weighed	214 lbs.
900 lbs. of wet refuse removed after the trial .	
A sample of 215 lbs. of this weighed	134

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—February 15 and 16, 1909. Trial Number—26.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
11.30 a.m.....	8·5	0·8	0·5	6·0	5·4	11·1	67·7	23·0
1.00 p.m.....	9·3	0·8	0·4	12·6	3·9	16·4	56·6	33·3
2.00 “	10·5	0·7	0·1	9·7	3·1	10·8	65·1	33·7
3.05 “	8·8	0·8	0·6	9·3	5·3	17·2	58·0	32·4
4.00 “	11·7	0·8	0·1	9·1	3·1	12·9	62·3	25·2
5.00 “	10·7	0·7	0·0	11·3	3·2	8·1	66·0	22·6
6.00 “	9·6	1·0	0·0	9·2	3·0	11·4	65·8	23·6
7.05 “	10·9	0·7	0·3	9·3	3·0	13·8	62·0	26·4
8.05 “	8·0	0·6	0·1	13·3	3·3	13·7	61·0	30·4
9.05 “	9·2	0·5	0·2	11·6	3·7	16·5	58·3	32·0
10.05 “	15·1	0·7	0·0	10·3	2·3	12·8	58·8	25·4
11.05 “	12·6	0·5	0·1	11·8	1·7	10·6	62·7	24·2
12.05 “	13·5	0·6	0·0	11·4	1·6	12·6	60·3	25·6
1.05 a.m.....	11·6	0·5	0·2	11·5	1·6	12·7	61·9	26·0
2.05 “	11·3	0·7	0·0	10·1	2·2	12·0	63·7	24·3
3.05 “	11·3	0·7	0·2	8·1	3·8	8·2	67·7	20·3
4.05 “	10·5	0·7	0·3	8·2	3·8	11·5	65·0	23·8
5.05 “	11·3	0·5	0·2	10·3	3·0	9·0	65·7	22·5
6.05 “	11·6	0·6	0·1	7·9	2·6	8·1	69·1	18·7
7.05 “	11·1	0·7	0·0	10·3	3·2	9·2	65·5	22·7
8.05 “	9·7	0·7	0·2	12·4	1·9	11·8	63·3	26·3

OBSERVATIONS OF GAS METER AND B. H. P.

Date—February 15 and 16, 1909. Trial Number—26.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
11.35 a.m. ..	1983600	....	N.B.O.	275	95	180	74722
12.05 p.m. ..	1985280	1680	"	275	95	180	....
12.35 " ..	1987150	1870	"	275	95	180	....
1.05 " ..	1988950	1800	"	275	95	180	....
1.35 " ..	1990860	1910	"	275	95	180	....
2.05 " ..	1992700	1840	"	250	90	160	94500
2.35 " ..	1994600	1900	"	250	90	160	....
3.05 " ..	1996200	1600	"	250	90	160	....
3.35 " ..	1997900	1700	"	250	90	160	....
4.05 " ..	1999640	1740	"	250	90	160	....
4.35 " ..	2001260	1620	"	250	90	160	....
5.05 " ..	2003000	1740	"	250	90	160	....
5.35 " ..	2004750	1750	"	250	90	160	....
6.05 " ..	2006500	1750	"	250	82	168	....
6.35 " ..	....	....	....	250	82	168	....
7.05 " ..	2010050	3550	B.O.	250	82	168	....
7.35 " ..	2011400	1350	N.B.O.	250	82	168	....
8.05 " ..	2013400	2000	"	250	82	168	....
8.35 " ..	2015050	1650	"	250	82	168	....
9.05 " ..	2016780	1730	"	250	82	168	37600
9.35 " ..	2018550	1770	"	250	82	168	.....
10.05 " ..	2020350	1800	"	250	82	168	.....
10.35 " ..	2022300	1950	"	250	82	168	.....
11.05 " ..	2024170	1870	"	250	82	168	.....
11.35 " ..	2026180	2010	"	250	82	168	.....
12.05 a.m. ..	2028075	1895	"	250	85	165	57439
12.35 " ..	2030010	1935	"	250	85	165	......
1.05 " ..	2031990	1980	"	250	85	165	...
1.35 " ..	2033825	1835	"	250	85	165	
2.05 " ..	2035690	1865	"	250	85	165	...
2.35 " ..	2037730	2040	"	250	85	165	
3.05 " ..	2039730	2000	"	250	85	165	
3.35 " ..	2041625	....	"	250	85	165	...
4.05 " ..	2043085	1460	"	250	85	165	....
4.35 " ..	2044060	1575	"	250	85	165	....
5.05 " ..	2046455	1795	"	250	85	165	89555
5.35 " ..	2048370	1915	"	250	85	165	
6.05 " ..	2049930	1560	"	250	85	165	
6.35 " ..	2051820	1890	"	250	85	165	
7.05 " ..	2053750	1930	"	250	85	165	
7.35 " ..	2055500	1750	"	250	85	165	
8.05 " ..	2056950	1450	"	250	85	165	
8.35 " ..	2058750	1800	"	250	85	165	
9.05 " ..	2060940	2190	"	250	85	165	
9.35 " ..	2062780	1840	"	250	85	165	
10.05 " ..	2063580	1800	"	250	85	165	
10.35 " ..	2066000	1420	"	250	85	165	
11.05 " ..	2067720	1720	"	250	85	165	
11.35 " ..	2069230	1510	"	250	85	165	31625

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—February 15 and 16, 1909. Trial Number—28

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs	
11.35 a.m.										
12.05 p.m.	53	½	3·79	11·26	1630	96·5	12.00 p.m.	50	50	
12.35 "	53	½	3·71	10·48	1740	93·4	12.40 "	50	100	
1.05 "	54	½	3·67	11·07	1755	103·0	1.05 "	50	150	
1.35 "	54	½	3·77	10·37	1775	92·8				
2.05 "	55	½	3·87	10·57	1760	93·4	2.25 "	50	200	
2.35 "	55	½	3·86	11·34	1730	102·5				
3.05 "	56	½	3·99	11·55	1760	105·4	3.05 "	50	250	3.05 p.m.
3.35 "	56	½	3·56	10·43	1870	101·8	3.40 "	100	350	3.40 "
4.05 "	57	½	3·74	10·07	1830	100·5				
4.35 "	57	½	3·77	12·23	1840	123·4	4.30 "	50	400	
5.05 "	58	½	3·55	10·45	1830	100·0				5.25 "
5.35 "	59	5/12	3·85	11·24	1600	112·5	5.25 "	50	450	
6.05 "	58	½	3·75	10·68	1840	101·5	6.15 "	50	500	6.15 "
6.35 "	59	½	3·77	10·36	1776	92·7	7.05 "	75	575	
7.05 "	61	5/12	4·48	12·69	1600	124·9				7.00 "
7 35 "	61	5/12	4·46	11·36	1600	113·4				
8.05 "	61	5/12	4·32	11·38	1600	107·3	8.05 "	50	625	8 05 "
8.35 "	61	5/12	4·20	11·29	1640	110·5				
9.05 "	61	⅓	4·77	9·53	1600	109·6	9.05 "	50	675	
9.35 "	61	5/12	3·92	9·02	1970	106·8	9.55 "	50	725	
10.05 "	60	⅓	3·75	9·90	1600	117·0				
10.35 "	61	⅓	4·22	9·49	1610	101·0				
11.05 "	61	⅓	4·23	9·16	1770	103·8	11.25 "	50	775	
11.35 "	61	5/12	4·28	9·11	1970	90·5				
12.05 a.m.	62	⅓	4·72	9·31	1660	90·5				
12.35 "	62	½	4·44	10·38	1800	87·5				
1.05 "	63	5/12	4·52	11·03	1610	99·5	1.00 a.m.	50	825	
1 35 "	63	5/12	4·78	10·16	1735	88·7	1.40 "	50	875	
2.05 "	63	5/12	4·60	9·79	1875	92·5				
2 35 "	62	⅓	4·28	9·04	1615	91·5	2.30 "	50	925	
3 05 "	62	⅓	4·25	9·25	1695	100·8	3.05 "	50	975	
3 35 "	62	7/12	4·13	11·04	1725	81·0	3.55 "	50	1025	
4 05 "	62	½	4·40	13·31	1600	113·0	4.05 "	25	1050	4.05 a.m.
4.35 "	62	½	4·49	10·66	1675	81·8				
5.05 "	61	½	4·43	11·66	1680	89·6	5.00 "	-	1100	5.20 "
5.35 "	62	7/12	4·81	13·04	1740	103·1				
6.05 "	63	7/12	4·64	12·11	1730	87·7	6.05 "		1150	
6 35 "	63	7/12	4·81	12·13	1740	85·8	6.40 "		1200	6.40 "
7 05 "	64	7/12	4·96	12·42	1760	89·2				
7 35 "										
8 05 "	64	½	4·90	12·39	1600	95·0	8.00 "	50	1250	7.50 "
8.35 "	64	½	5·10	12·05	1640	90·2				
9.05 "	64	½	4·12	11·47	1850	100·4	9.00 "	50	1300	9 20 "
9 35 "										
10 05 "	65	½	5·42	14·60	1750	119·0	9.25 "	50	1350	
10 35 "	65	5/12	5·25	10·40	1840	90·2	10.00 "	50	1400	10.00 "
11 05 "	65	5/12	5·05	12·25	1620	111·4	10.35 "	50	1450	10.35 "
11 35 "										

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—February 15 and 16, 1909. **Trial Number—26.**

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet.	Producer Outlet.	Inlet.	Outlet.
11.35 a.m..	760	55	53	58	3·5	5·4	5·6	7·0	6·1	1·4		
12.05 “ .	830	58	56	119	3·5	6·0	6·2	7·9	6·7	1·5	39	36
12.35 p.m.	880	57	56	140	3·6	6·4	6·6	9·0	7·4	2·0	48	45
1.05 “ .	860	57	56	141	3·6	5·8	6·0	8·5	6·0	2·0	47	44
1.35 “ .	850	58	57	142	3·5	5·6	5·8	8·0	6·2	2·0	46	43
2.05 “ .	860	58	58	140	3·5	5·5	5·7	8·0	5·4	1·6	50	47
2.35 “ .	860	58	58	139	3·5	5·5	5·7	8·1	5·5	1·5	59	56
3.05 “ .	860	59	59	143	3·5	6·8	7·0	8·3	6·4	1·7	63	60
3.35 “ .	900	60	60	144	3·7	6·7	6·9	9·7	7·2	1·8	73	71
4.05 “ .	820	60	60	145	3·4	5·0	5·2	6·9	5·2	1·5	65	62
4.35 “ .	840	60	60	142	3·5	6·0	6·2	9·0	7·0	1·7	68	67
5.05 “ .	810	61	60	144	3·6	5·5	5·7	8·4	6·6	2·2	60	67
5.35 “ .	840	62	62	144	3·6	6·2	6·4	9·3	7·0	2·2	70	67
6.05 “ .	800	62	62	145	3·5	5·3	5·5	7·0	5·3	1·6	68	65
6.35 “ .	..	..	..	..	..	..	..	..	..	..	..	..
7.05 “ .	810	63	65	144	3·4	4·5	4·7	6·0	4·7	1·4	60	58
. .35 “ .	810	64	65	141	3·5	5·5	5·7	8·6	7·0	1·7	46	49
8.05 “ .	860	64	64	133	4·0	7·0	7·2	11·0	9·2	1·7	35	32
8.35 “ .	800	63	64	130	3·5	5·4	5·6	8·0	7·6	1·8	30	27
9.05 “ .	860	62	62	128	4·0	7·3	7·5	10·8	9·5	1·5	55	52
9.35 “ .	830	62	63	130	3·6	5·8	6·0	8·3	7·2	1·6	51	48
10.05 “ .	910	64	60	128	3·6	6·3	6·5	10·0	8·9	1·9	30	27
10.35 “ .	880	63	62	128	3·6	6·4	6·6	9·5	8·4	1·5	41	39
11 05 “ .	870	62	62	129	3·7	6·6	6·8	9·8	8·4	1·7	36	34
11.35 “ .	900	62	62	128	3·7	6·6	6·8	10·0	9·0	2·0	76	74
12.05 a.m..	900	61	62	129	3·7	6·6	6·8	10·0	8·8	1·8	70	65
12 35 “ .	910	63	66	128	3·7	6·6	6·8	10·0	8·7	1·6	60	56
1.05 “ .	910	62	66	126	3·7	6·6	6·8	9·9	8·6	1·6	39	35
1.35 “ .	900	63	66	126	3·6	6·3	6·8	9·5	8·3	1·8	54	50
2.05 “ .	910	63	66	127	3·6	6·3	6·5	10·0	8·8	2·0	62	59
2 35 “ .	920	67	63	121	3·7	6·5	6·7	10·0	8·9	1·8	64	60
3.05 “ .	920	64	62	129	3·5	6·4	6·0	9·5	8·3	1·5	64	60
3.35 “ .	930	64	64	125	3·9	6·9	7·1	10·5	9·8	1·8	67	64
4.05 “ .	920	63	63	100	4·5	7·2	7·4	8·7	7·8	2·4	60	56
4.35 “ .	860	62	63	120	3·8	6·5	6·7	7·0	6·2	1·4	67	62
5.05 “ .	900	62	60	118	3·7	6·4	6·6	9·9	8·8	1·7	58	55
5.35 “ .	880	63	65	130	3·4	6·1	6·3	7·2	6·5	1·5	62	59
6.05 “ .	890	64	65	127	3·8	6·6	6·8	10·3	8·9	1·8	49	45
6.35 “ .	890	65	66	128	3·8	6·6	6·8	10·8	10·2	1·9	50	46
7.05 “ .	870	66	68	130	3·6	6·2	6·4	12·0	10·8	1·8	52	48
7.35 “ .	880	66	68	122	3·6	6·2	6·4	12·0	11·1	1·9	54	50
8.05 “ .	850	66	67	127	3·6	6·2	6·4	9·9	9·0	2·0	58	56
8.35 “ .	850	66	67	128	3·9	6·3	6·5	10·0	9·0	2·0	63	60
9.05 “ .	800	66	65	124	4·1	6·8	7·0	11·3	9·3	1·8	50	47
9.35 “ .	830	66	63	127	3·6	6·2	6·4	7·3	5·7	1·4	50	47
10.05 “ .	850	66	67	130	3·6	6·2	6·4	8·1	7·0	1·8	51	48
10.35 “ .	960	66	67	134	3·6	6·1	6·3	10·3	9·6	2·0	50	47
11.05 “ .	860	66	67	122	3·6	6·1	6·3	10·2	9·6	2·0	52	49
11.35 “ .	820	66	67	125	3·6	6·1	6·3	8·1	7·0	0·6	60	57

PRODUCER TRIAL No. 26.

Date—February 15-16, 1909. Producer No. 4, at McGill University

Time of lighting up—7.30 a.m. Trial commenced 11.35 a.m., February 15; ended 11.35 a.m., February 16.

Duration of trial—24 hours. Kind of fuel—No. 8 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Killam, Cameron, Ford.

Chemists—Stansfield, Nicolls, Campbell.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1450
2.	Moisture in coal as charged	per cent.	1·9
3.	Calorific value of coal as charged, per lb.	B.T.U.	13600
4.	" " of dry coal per lb.	B.T.U.	13860
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 61·6; volatile matter, 27·5; ash, 9·0; moisture, 1·9	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 63·8; volatile matter, 2·7. Total	per cent.	66·5
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	85630
9.	Average temperature of gas leaving producer	°F.	827
10.	" " " at meter	°F.	63
11.	Average temperature of air in producer house	°F.	63
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	99·8
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	101·3
13b.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	91·9
14.	Average barometric pressure	lbs. sq in.	14·66
15.	" suction at producer	ins. of water	1·5
16.	" suction at exhauster	ins. of water	9·15
17.	" pressure of gas at meter	ins. of water	4·9

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2040
19.	" water used in scrubber and gas washer	lbs.	38580
20.	" tar extracted in scrubber and gas washer	lbs.	55
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		3138·06
24.	Average explosions per minute		102·5
25.	Average effective load on brake	lbs.	16606
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	62·3

28.

Notes.

Fire poked at: 3.05, 3.40, 5.25, 6.15, 7.00 p.m.;4.05, 5. 20, 6.40, 7.50, 9.20, 10.00, 10.35 a.m.

Refuse removed at: 3.05, 3.40, 5.25, 6.15, 7.00, 7.35 p.m.; 4.05, 5.20, 6.10, 9.00, 9.20, 10 00, 10 35 a m.

Behaviour of coal: Not very well adapted for producer work.

Average time between poking: 2 hours.

Clinker: No tendency to clinker.

Tar: No trouble.

State of engine valves at end of trial: Good condition, cleaning not needed.

Valves last cleaned: Jan. 29, 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·7%
Carbon	77·6%
Nitrogen	1·6%
Oxygen	0·6%
Sulphur	0·9%
Total carbon contained by dry coal charged	1103·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	10·8%
Oxygen	0·7%
Carbon monoxide	10·2%
Hydrogen	11·9%
Methane	3·1%
Ethylene	0·2%
Nitrogen	63·1%

Remarks.

No tendency to arch or clinker. Calorific value of gas low. Some trouble from dirt collecting in pipes. Economic results not very good.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1422
32.	Combustible charged during trial	lbs.	1291
33.	Average B.H.P. of engine during trial	H.P.	26·49
34.	“ indicated H.P. of engine during trial	H.P.	36·54
35.	“ H.P. taken by exhauster and gas washer	H.P.	4·0
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	26·49
37.	“ “ “ corresponding to total gas produced	H.P.	
38.	“ “ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	22·49

Hourly Quantities.

39.	Coal charged per hour	lbs.	60·4
40.	Dry coal charged per hour	lbs.	59·3
41.	Combustible charged per hour	lbs.	53·8
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	15·1
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	14·8
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	13·5
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	9·12
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	10·42
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3568
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3510
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3568
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3510
51.	Calorific value of coal charged per hour	B.T.U.	822000
52.	“ “ gas produced per hour (lower value)	B.T.U.	322500
53.	Steam used in producer per hour	lbs.	85·0

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	58·2
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	59·2
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	65·2
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	96·1
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	132·6
59.	Steam used in producer per lb. coal charged	lbs.	1·407
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	26·6
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	449·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	39·3
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	33·3
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	28·5
65.	Thermal efficiency of engine, based on B.H.P	per cent.	20·9
66.	Over all efficiency of producer and engine plant	per cent.	8·2
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12,190
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	31,010

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·28	2·24	2·03
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·69	2·64	2·39
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·14	3·08	2·80

dirt

1422
1291
3·49
3·54
4·0
3·49

2·49

50·4
59·3
53·8
15·1
14·8
13·5
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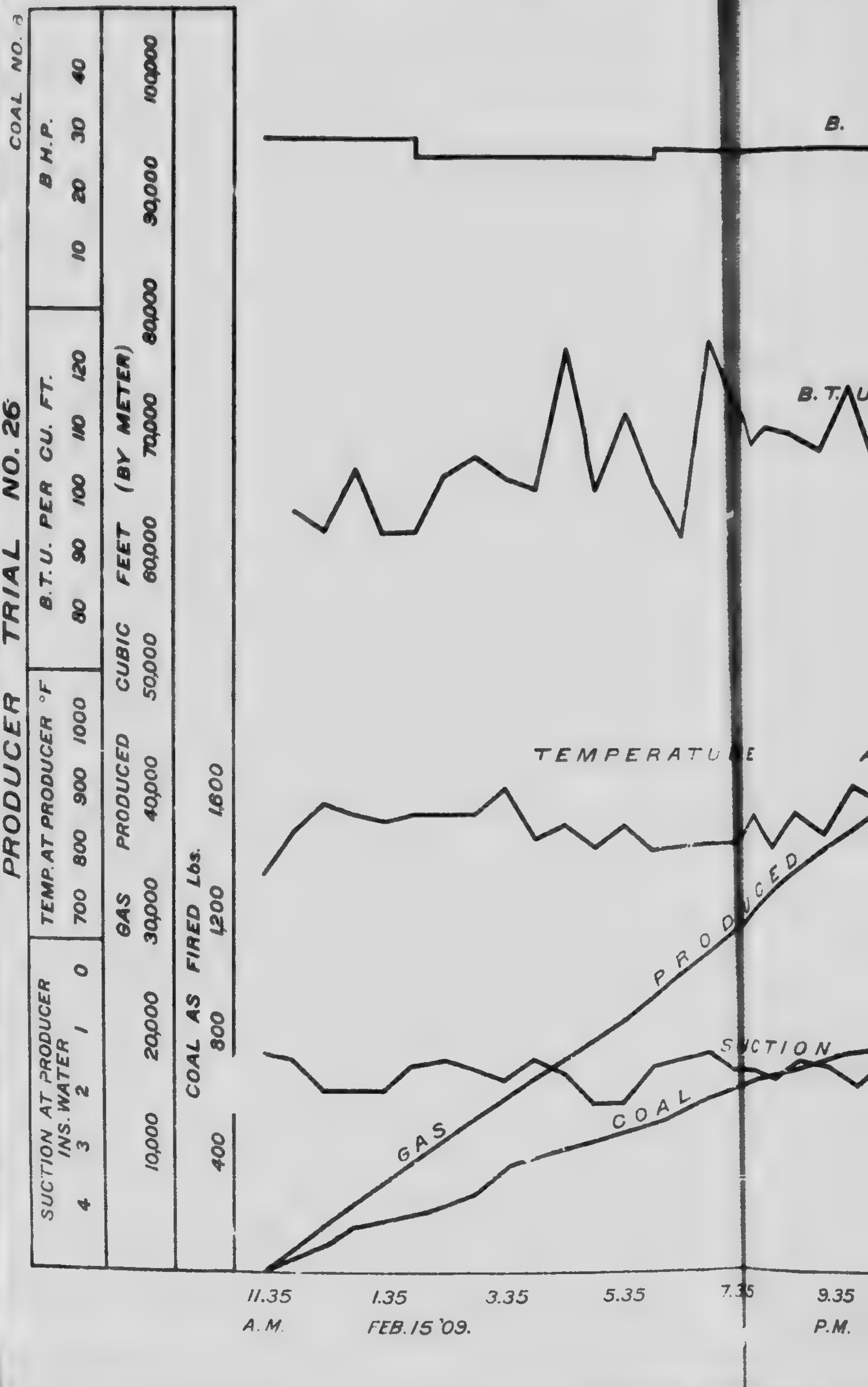
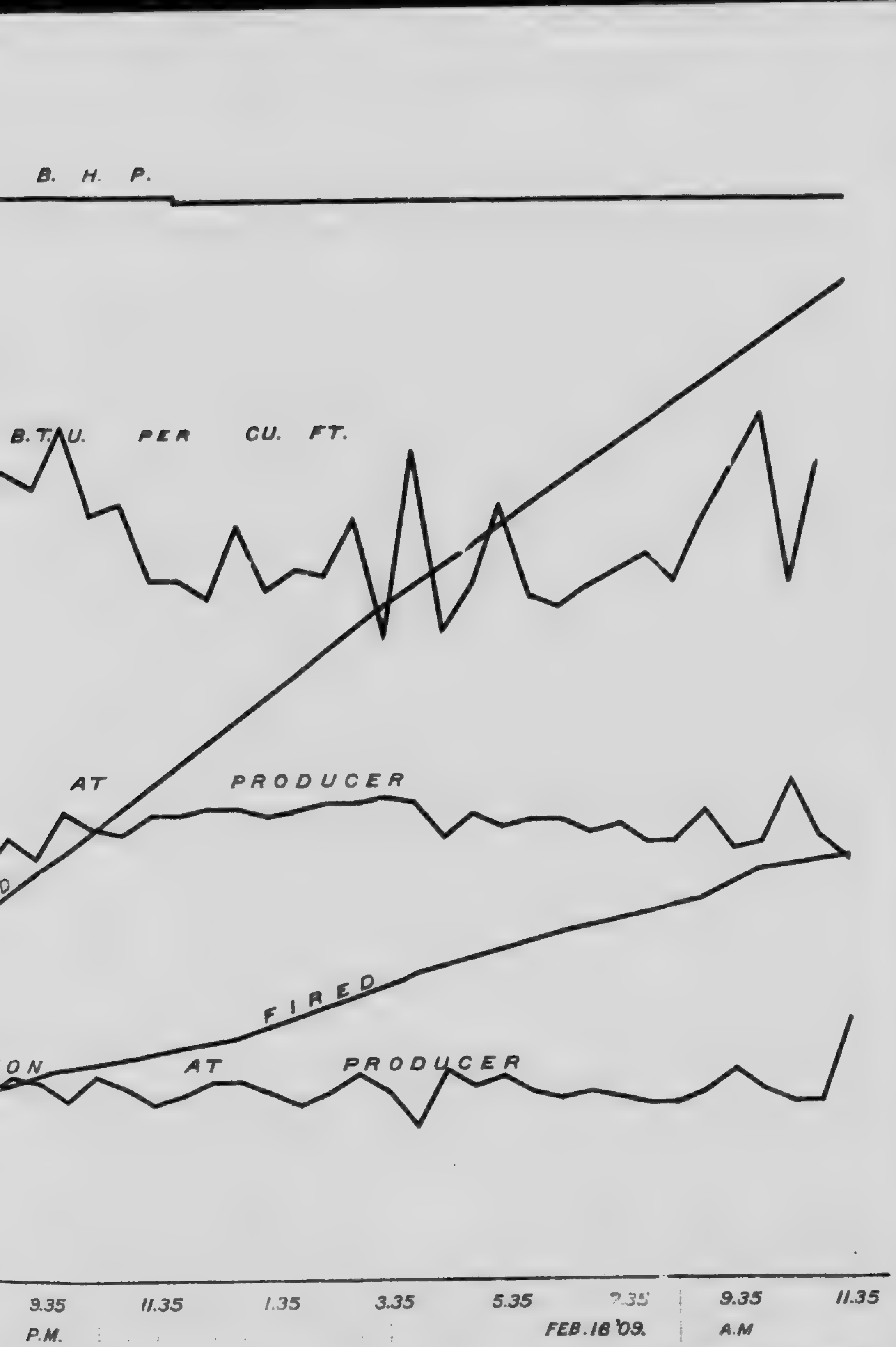

PRODUCER TRIAL NO. 26
COAL NO. 8
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
TEMP. AT PRODUCER °F
700 800 900 1000
B.T.U. PER CU. FT.
80 90 100 110 120
B H.P.
10 20 30 40
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1200 1600
B.
B.T.U
TEMPERATURE
GAS PRODUCED
SUCTION
COAL
11.35 A.M.
1.35
FEB. 15 '09.
3.35
5.35
7.35
9.35 P.M.



APPENDIX III VOL.V

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TRIAL OF No. 4 PRODUCER WITH COAL No. 3

Date—January 25 and 26, 1909. Trial Number—23.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29.45 inches.
" " 9 p.m., Jan. 25	29.45 "
" " end of trial	29.62 "
Water meter reading at 10 a.m., Jan. 25	68,122 imperial gallons.
" " " 8 a.m., " 26	71,431 " "
Difference, in 22 hours	3,309 " "
Brick in producer base	900 lbs.
Average level of fuel below top plate of the producer	20 inches.

Time.				
4.00	a.m.,	Jan.	25	Started fire with 10 lbs. of shavings, 40 lbs. of wood, and 120 lbs. of coke.
6.00	"	"	"	Down-draft with fan exhausting directly to the atmosphere.
6.00	"	"	"	Charged 100 lbs. of coal
6.30	"	"	"	" 50 "
7.00	"	"	"	" 50 "
7.30	"	"	"	" 50 "
8.00	"	"	"	" 50 "
8.30	"	"	"	Down-draft with blower.
8.40	"	"	"	Started engine.
8.45	"	"	"	Started trial.
7.45	"	"	26	Finished trial.

Notes.

Explosion counter gave trouble.	
Tar removed from the wet scrubber	44 lbs.
Tar removed from the gas washer	1 lb.
403 lbs. of wet refuse removed from the producer during the trial.	
193 lbs. of this when dried weighed	120 lbs.
995 lbs. of wet refuse removed after the trial.	
195 lbs. of this when dried weighed	112 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 25 and 26, 1909. Trial Number—23.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m.....	11·1	0·9	0·1	11·1	3·0	6·9	66·9	21·1
10.00 "	9·2	0·4	0·2	17·1	1·7	5·2	66·2	24·2
11.00 "	9·2	0·3	0·0	14·2	2·1	5·4	68·8	21·7
12.00 p.m.....	10·5	1·3	0·2	11·4	2·2	9·7	65·7	22·5
1.05 "	12.5	0·6	0·2	11·2	3·4	14·1	58·0	28·9
2.00 "	13·9	0·3	0·2	10·9	1·7	11·1	61·9	23·9
3.00 "	12·5	0·5	0·0	9·5	2·2	11·8	63·5	23·5
4.00 "	11·5	0·3	0·1	12·2	1·8	13·3	60·8	27·4
5.00 "	15·5	0·4	0·0	9·4	2·1	13·6	59·0	25·1
7.00 "	11·1	0·4	0·2	12·5	2·1	13·0	60·7	27·8
8.00 "	12·5	0·5	0·1	12·0	2·1	10·3	62·5	24·5
9.00 "	12·4	0·4	0·1	12·3	1·2	12·1	61·5	25·7
9.30 "	9·2	0·3	0·3	13·0	5·6	19·8	51·8	38·7
10.00 "	12·1	0·4	0·3	12·6	1·7	14·5	58·4	29·1
11.00 "	12·8	0·4	0·0	11·0	2·1	12·9	60·8	26·0
12.00 a.m.....	11·2	0·5	0·2	10·6	2·2	13·5	61·8	26·5
1.00 "	12·8	0·3	0·2	11·8	2·1	10·9	61·9	25·0
2.00 "	11·7	0·3	0·0	12·1	2·2	13·1	60·6	27·4
3.00 "	12·8	0·5	0·2	11·5	2·1	11·1	61·8	24·9
4.00 "	10·5	0·4	0·2	14·6	1·5	13·8	59·0	30·1
5.00 " ...	10·6	0·5	0·3	13·2	2·1	10·2	63·1	25·8
5.45 "	10·7	0·4	0·2	12·9	2·1	8·7	65·0	23·9
6.50 "	9·2	0·4	0·1	12·2	2·2	14·3	61·6	28·8
7.00 "	10·2	0·4	0·4	13·7	1·7	9·4	64·2	25·2
8.00 "	9·9	0·4	0·1	13·7	1·7	13·9	60·3	29·1

OBSERVATIONS OF GAS METER AND B. H. P.

Date—January 25 and 26, 1909. Trial Number—23.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
8 45 a.m.	1714480		N.B.O.		250	70	180	04680
9 15 "	1716160	1680	"		250	70	180	
9 45 "	1718000	1840	"		275	95	180	11280
10 15 "	1720050	2050	"		275	95	180	
10 45 "	1721895	1845	"		275	95	180	
11 15 "	1723420	2025	"		250	70	180	21200
11 45 "	1726000	2080	"		250	85	165	
12 15 p.m.	1728000	2000	"		250	85	165	
12 45 "	1730000	2000	"		250	85	165	
1 15 "	1731770	1770	"		250	85	165	
1 45 "	1733860	2090	"		250	85	165	
2 15 "	1736000	2140	B.O.		250	85	165	
2 45 "	1737780	1780	N.B.O.		250	85	165	
3 15 "	1739660	1880	"		250	85	165	
3 45 "	1741580	1920	"		250	85	165	
4 15 "	1743400	1820	"		250	85	165	
4 45 "	1745220	1820	"		250	85	165	
5 15 "	1746400	1180	"	(5.00)	250	80	170	
5 45 "	1748920	1520	"		250	80	170	
6 15 "	1750140	1820	"		250	80	170	
6 45 "	1752360	1620	"		250	80	170	
7 15 "	1754130	1770	"		250	80	170	74480
7 45 "	1755930	1800	"		250	80	170	
8 15 "	1757800	1870	"		250	80	170	
8 45 "	1759770	1970	"		250	80	170	
9 15 "	1761710	1940	"		250	75	175	14560
9 45 "	1763750	1940	"		250	75	175	
10 15 "	1765100	1950	"		250	75	175	
10 45 "	1767750	2050	"		250	75	175	
11 15 "	1769630	1880	"		250	75	175	
11 45 "	1771560	1930	"		250	75	175	
12 15 a.m	1773380	1820	"		250	75	175	
12.45 "	1775200	1820	"		250	75	175	
1 15 "	1777190	1980	"		250	75	175	
1 45 "	1779120	1930	"		250	75	175	
2 15 "	1780680	1560	"		250	75	175	
2 45 "	1782650	1970	"		250	75	175	
3 15 "	1784400	1750	"		250	85	165	27785
3 45 "	1786310	1910	"		250	85	165	
4 15 "	1788235	1925	"		250	85	165	
4 45 "	1790190	1955	"		250	85	165	
5 15 "	1791930	1740	"		250	85	165	
5 45 "	1793720	1790	"		250	85	165	
6 15 "	1795550	1830	"		250	85	165	
6 45 "	1797300	1750	"		250	85	165	
7 15 "	1799170	1870	"		250	85	165	
7 45 "	1801080	1910	"		250	85	165	
8 05 "	1802280	1200	"		250	85	165	39935

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—January 25 and 26, 1909. Trial Number—23.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
9.15 a.m.	58	5/12	4·56	10·39	1755	97·3	8.45	....	....	....
9.45 "	59	5/12	4·12	10·38	1800	107·2	8.50	50	50	....
10.15 "	60	5/12	4·94	11·08	1620	94·6	10.05	25	75	....
10.45 "	61	1/3	5·11	11·82	1700	90·5	11.00	50	125	....
11.15 "	62	1/2	5·18	11·18	1850	87·8	11.30	25	150	11.30
11.45 "	63	5/12	5·23	11·50	1610	94·9	12.15	50	200	....
12.15 p.m.	63	5/12	5·22	11·88	1600	101·3	1.10	50	250	....
12.45 "	64	1/3	5·38	11·74	1865	94·1	2.10	50	300	....
1.15 "	64	1/2	5·51	11·94	1820	92·8	3.00	25	325	....
1.45 "	65	1/3	5·53	12·06	1845	95·4	3.45	50	375	....
2.15 "	65	1/3	5·59	12·62	1790	99·7	4.45	50	425	4.40
2.45 "	66	1/2	5·36	11·98	1780	93·4	5.15	50	475	5.15
3.15 "	66	1/3	5·31	12·29	1750	96·8	6.35	50	525	5.40
3.45 "	66	1/3	5·50	12·68	1770	100·8	8.00	50	575	....
4.15 "	67	1/3	5·35	11·99	1865	97·5	9.05	50	625	9.30
4.45 "	67	1/2	5·50	14·10	1840	125·3	9.35	50	675	10.20
5.15 "	67	1/3	6·12	12·89	1800	96·3	10.35	75	750	....
5.45 "	68	1/2	6·72	13·65	1875	103.0	11.50	50	800	11.50
6.15 "	68	1/2	6·80	13·81	1820	101·0	1.30	50	850	1.30
6.45 "	68	5/12	6·57	13·70	1660	103·6	2.30	50	900	....
7.15 "	68	5/12	7·18	13·01	1755	87·2	3.15	50	950	3.15
7.45 "	68	5/12	6·55	12·31	1860	101·8	4.30	50	1000	....
8.15 "	68	5/12	6·77	12·75	1875	106·5	5·15	50	1050	5.15
8.45 "	68	1/3	6·36	11·58	1670	103·6	5.45	50	1100	5.45
9.15 "	68	5/12	6·92	12·93	1785	101·9				
9.45 "	68	5/12	6·13	12·01	1850	103·5				
10.15 "	68	5/12	6·63	11·04	1920	98·7				
10.45 "	67	5/12	5·32	10·92	1990	105·9				
11.15 "	67	1/3	5·18	10·55	1630	104·0				
11.45 "	67	1/3	5·41	9·91	1770	94·7				
12.15 a.m.	66	5/12	5·33	10·70	1900	97·0				
12.45 "	66	5/12	5·55	10·59	1860	88·1				
1.15 "	66	5/12	5·57	10·96	1880	96·2				
1.45 "	66	5/12	5·50	12·05	1810	112·6				
2.15 "	66	5/12	5·43	11·07	1890	101·3				
2.45 "	65	1/3	5·00	10·46	1760	104·5				
3.15 "	66	5/12	5·52	12·11	1810	113·3				
4.15 "	65	5/12	5·56	11·52	1610	102·6				
4.45 "	65	5/12	5·33	11·53	1900	112·0				
5.15 "	65	5/12	5·23	11·23	1890	106·0				
5.45 "	65	1/3	5·33	10·18	1660	95·6				
6.15 "	65	1/3	5·16	10·29	1720	105·0				
6.45 "	65	1/3	5·67	11·09	1720	123·0				
7.15 "	64	1/3	5·20	9·88	1940	108·0				
7.45 "	64	1/3	5·19	10·38	1950	120·3				

OBSERVATIONS OF TEMPERATURES AND PRESSURES

Date—January 25 and 26, 1909. Trial Number—23.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.45 a.m.	640	61	60	67	3·7	5·4	5·6	7·3	3·7	2·3	66	64
9.15 “	700	61	62	126	3·7	6·3	6·5	8·6	4·0	1·6	68	65
9.45 “	740	62	63	108	3·8	6·6	6·8	8·9	4·3	2·0	60	56
10.15 “	780	62	65	167	3·9	6·5	6·7	8·6	4·0	21·5	67	63
10.45 “	810	64	66	141	4·0	6·8	7·0	9·6	3·9	1·5	70	66
11.15 “	840	64	66	144	3·9	6·8	7·0	9·4	4·1	1·7	70	65
11.45 “	850	66	67	146	4·0	6·7	6·9	9·9	4·3	2·6	63	60
12.15 p.m.	850	66	67	144	4·0	7·0	7·2	9·3	4·2	2·3	62	56
12.45 “	860	66	68	145	3·8	6·2	6·4	8·4	3·7	1·7	50	46
1.15 “	880	67	69	148	4·0	6·8	7·0	9·7	4·0	1·7	53	48
1.45 “	880	68	70	150	4·0	6·8	7·0	9·9	4·0	1·7	57	53
2.15 “	880	68	70	152	4·0	6·9	7·1	10·0	4·2	1·8	63	60
2.45 “	840	68	69	146	3·8	6·0	6·1	8·0	3·3	1·5	65	61
3.15 “	860	69	68	147	3·9	6·5	6·7	9·0	3·9	1·6	65	59
3.45 “	820	69	69	151	3·9	6·3	6·5	9·1	3·6	1·5	65	63
4.15 “	800	69	69	152	3·8	6·0	6·2	8·4	3·7	1·8	49	46
4.45 “	820	69	69	148	3·7	6·0	6·2	8·4	4·1	2·1	53	50
5.15 “	870	69	70	161	3·7	6·0	6·2	8·6	4·0	2·0	60	57
5.45 “	860	70	70	158	4·4	6·9	7·1	9·8	4·1	2·0	53	50
6.15 “	800	70	70	154	4·0	6·5	6·7	6·8	3·3	1·5	43	38
6.45 “	800	70	70	153	3·7	6·0	6·2	8·0	3·7	1·9	38	35
7.15 “	800	70	69	156	3·8	6·0	6·2	8·4	3·7	2·0	35	31
7.45 “	800	71	68	154	3·7	6·0	6·2	8·3	3·7	2·0	43	40
8.15 “	830	71	70	160	4·0	6·4	6·6	9·4	4·1	2·3	54	51
8.45 “	830	71	67	120	4·0	6·6	6·8	9·5	4·1	2·4	45	42
9.15 “	840	70	68	150	3·7	6·1	6·2	9·4	4·0	2·3	48	45
9.45 “	850	74	69	118	4·0	7·0	7·2	10·5	4·4	2·5	50	47
10.15 “	840	72	69	145	3·9	6·4	6·6	9·4	4·0	2·5	51	48
10.45 “	870	70	67	128	4·0	6·6	6·8	9·7	4·3	2·5	66	63
11.15 “	860	70	67	128	3·9	6·3	6·5	9·5	4·1	2·6	55	52
11.45 “	860	70	67	121	4·0	6·6	6·8	10·2	4·4	2·9	53	50
12.15 a.m.	840	69	66	121	3·9	6·0	6·2	8·8	4·0	2·5	61	59
12.45 “	860	70	67	137	4·0	6·6	6·8	10·0	5·3	2·7	70	67
1.15 “	850	70	67	136	4·0	6·3	6·6	10·0	4·1	2·6	65	62
1.45 “	850	69	67	145	3·9	6·0	6·2	8·4	4·0	2·3	60	57
2.15 “	820	68	67	144	3·5	5·6	5·8	8·0	3·9	2·3	60	57
2.45 “	850	68	66	143	3·9	6·0	6·2	9·3	4·2	2·6	60	57
3.15 “	850	68	67	140	3·7	6·2	6·4	9·4	4·2	2·6	68	65
3.45 “	840	68	67	142	3·9	6·4	6·6	9·6	3·9	2·5	67	64
4.15 “	820	68	66	144	4·0	6·5	6·7	10·8	4·4	2·6	52	56
4.45 “	810	68	66	143	4·0	6·5	6·7	10·4	4·6	3·0	59	56
5.15 “	800	68	65	146	3·8	6·0	6·2	9·2	4·4	2·7	65	62
5.45 “	800	68	66	143	3·9	6·0	6·2	10·0	4·3	2·7	60	57
6.15 “	800	68	64	145	3·9	6·0	6·2	10·2	4·6	2·9	53	50
6.45 “	800	68	64	143	3·8	5·9	6·1	10·3	4·7	2·9	50	47
7.15 “	800	66	64	149	3·9	6·0	6·2	10·6	4·8	3·1	60	57
7.45 “	800	66	64	146	3·8	6·1	6·3	10·2	4·5	3·0	48	45

PRODUCER TRIAL No. 23.

Date—January 25-26, 1909. Producer No. 4, at McGill University.

Time of lighting up—4.00 a.m. Trial commenced 8.45 a.m. January 25; ended 7.45 a.m. January 26.

Duration of trial—23 hours. Kind of fuel—No. 3 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Killam, Cameron.

Chemists—Nicolls, Stansfield, Campbell.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1100
2.	Moisture in coal as charged	per cent.	1·3
3.	Calorific value of coal as charged, per lb.	B.T.U.	12780
4.	" " of dry coal per lb.	B.T.U.	12960
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 62·7; volatile matter, 24·0; ash, 12·0; moisture, 1·3	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 53·1; volatile matter, 4·8	Total per cent.	57·9
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	40

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	86600
9.	Average temperature of gas leaving producer	°F.	824
10.	" " " at meter	°F.	68
11.	Average temperature of air in producer house	°F.	67
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	101·5
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	106·0
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	97·7
14.	Average barometric pressure	lbs. sq in.	14·46
15.	" suction at producer	ins. of water	2·24
16.	" suction at exhauster	ins. of water	9·95
17.	" pressure of gas at meter	ins. of water	5·46

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2070
19.	" water used in scrubber and gas washer	lbs.	40100
20.	" tar extracted in scrubber and gas washer	lbs.	45
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	2·5

ENGINE.

23.	Total revolutions during trial (from counter)		312000
24.	Average explosions per minute		105·1
25.	Average effective load on brake	lbs.	171·1
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in	64·5

28. **Notes.**

Fire poked at: 11.30 a.m.; 4.40, 5.15, 5.40, 9.30, 10.20, 11.50 p.m.; 1.30, 3.15, 5.15, 5.45 a.m.
Refuse removed at: 1.10, 4.45, 9.15, 9.20, 10.00, 11.50 p.m.; 3.15, 5.45 a.m.
Behaviour of coal: Well suited for producer work, required very little working.
Average time between poking: 2 hours and 5 minutes.
Clinker: No special difficulties recorded.
Tar: Fair amount removed from wet scrubber.
State of engine valves at end of trial: Good, did not require cleaning.
Valves last cleaned: Jan. 20, 1909.

29. ANALYSIS OF DRY COAL.

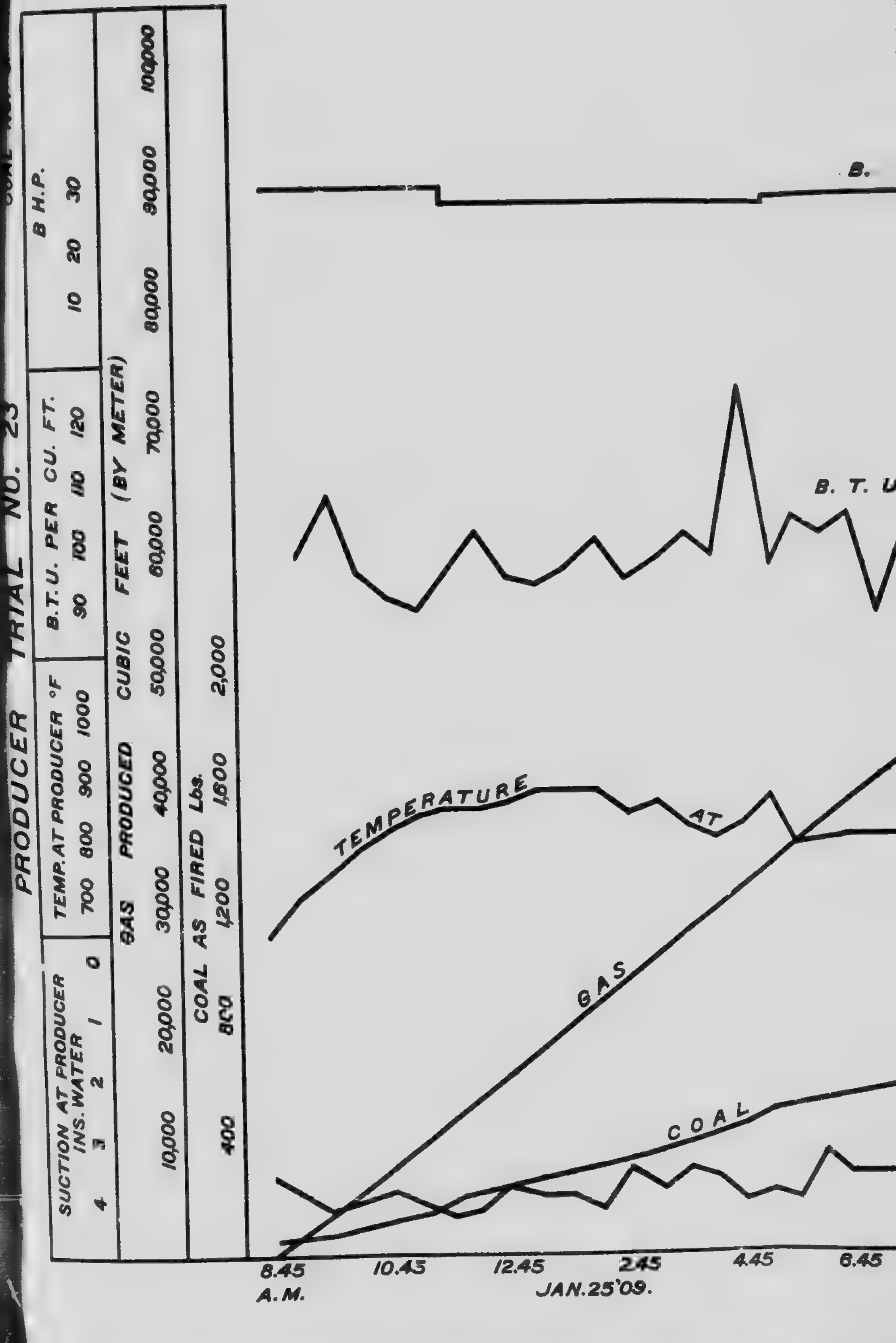
Hydrogen	4·3%
Carbon	72·6%
Nitrogen	2·1%
Oxygen	4·0%
Sulphur	2·5%

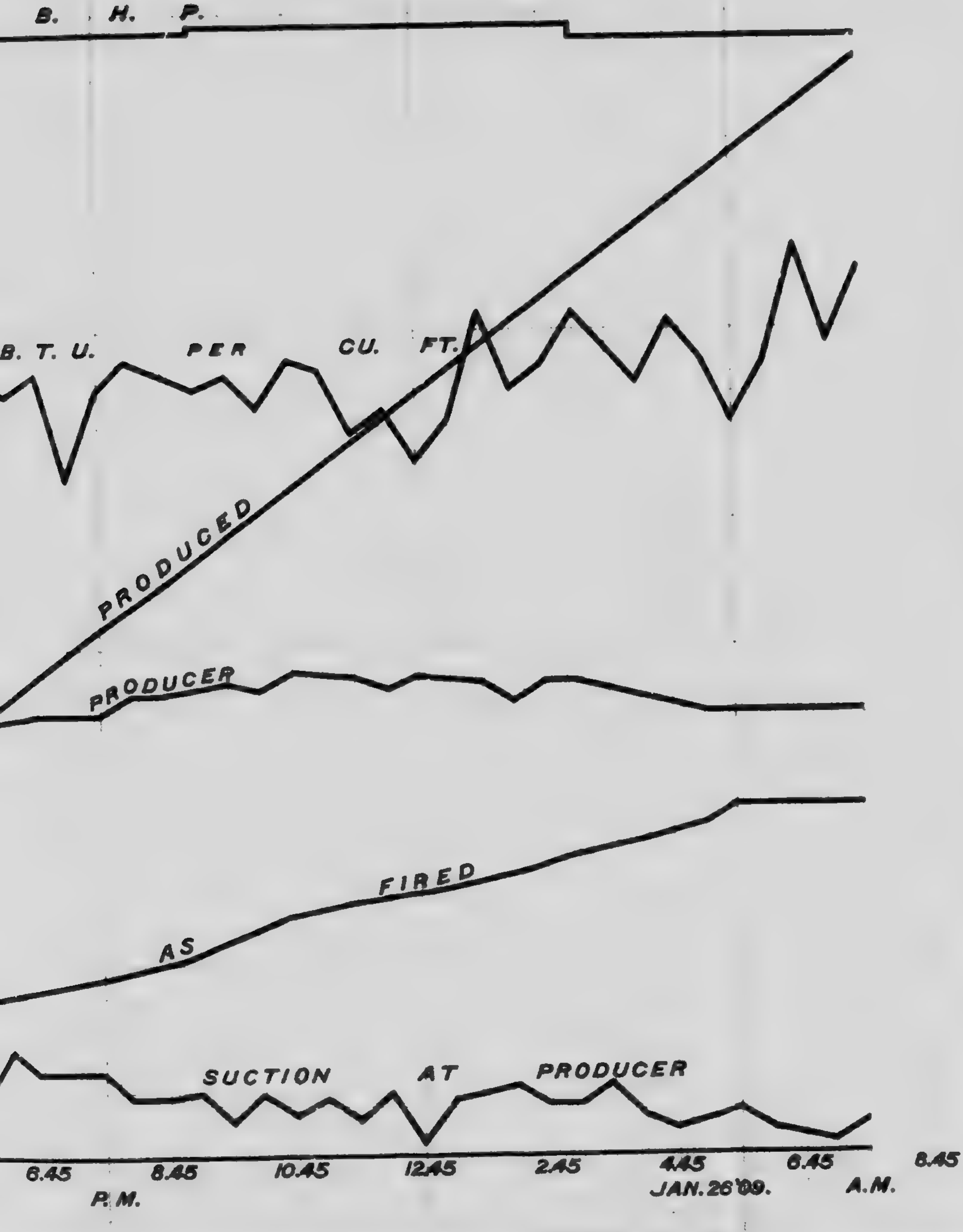
Total carbon contained by dry coal charged 789·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	11·4%
Oxygen	0·5%
Carbon monoxide	12·2%
Hydrogen	11·6%
Methane	2·2%
Ethylene	·2%
Nitrogen	[illegible]

PRODUCER TRIAL NO. 23 COAL NO. 3.


PRODUCER TRIAL NO. 23
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
TEMP. AT PRODUCER °F
700 800 900 1000
B.T.U. PER CU. FT.
90 100 110 120
B H.P.
10 20 30
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600 2,000
B.
B. T. U
TEMPERATURE AT
GAS
COAL
8.45 A.M.
10.45
12.45
2.45
4.45
6.45
JAN. 25'09.



APPENDIX III VOL. V

Remarks.

This coal gave gas of low calorific value but of fairly uniform quality, was easily worked and gave good economic results.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	1086
33.	Average B.H.P. of engine during trial	lbs	954
34.	" indicated H.P. of engine during trial	H.P.	27·10
35.	" H.P. taken by exhauster and gas washer	H.P.	38·90
36.	" B.H.P. while gas consumption of engine was taken	H.P.	5·0
37.	" " corresponding to total gas produced	H.P	27·10
38.	" " " " " " and	H.P.	27·10
	available for outside use, allowing for power used	H.P.	22·10

Hourly Quantities.

39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	47·8
41.	Combustible charged per hour	lbs.	47·2
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	41·5
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	11·9
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	11·8
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	10·4
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	8·8
47.	Gas (by meter) supplied by producer per hour	lbs.	11·74
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3763
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3605
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3763
51.	Calorific value of coal charged per hour	cub. ft.	3605
52.	" " gas produced per hour (lower value)	B.T.U.	612000
53.	Steam used in producer per hour	B.T.U.	351900
		lbs.	90·0

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	75·5
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	76·4
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	87·0
58	" " " " " " B.H.P. "	cub. ft.	92·7
59.	Steam used in producer per lb. coal charged	cub. ft.	133·0
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	1·88
61	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	36·5
62	Efficiency of process of gas production and cleaning, based on coal	lbs.	463·0
	charged	per cent.	57·8
63	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	47·1
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	37·7
65	Thermal efficiency of engine, based on B.H.P	per cent.	19·6
66.	Over all efficiency of producer and engine plant	per cent.	11·32
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12,990
68	" " coal charged into producer per B.H.P. per hr.	B.T.U.	22,490

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·76	1·74	1·53
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·16	2·14	1·88
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·70	2·66	2·34

SPRINGHILL COAL FIELD.

CUMBERLAND CO., NOVA SCOTIA.

TRIAL OF No. 4 PRODUCER WITH COAL No. 5

Date—January 21 and 22, 1909. Trial Number—22.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29.84 inches
" " 8.30 p.m.,	29.73 "
" " end of trial	29.97 "
Water meter reading at 9 a.m., Jan. 21	63,960 imperial gallons.
" " " 7 a.m., " 22	77,160 " "
Difference, in 22 hours	3,200 " "
Brick in producer base	1,000 lbs.
Average level of coal below top plate of producer	18 inches.

TIME			
3.00 a.m.,	Jan.	21	Fire started with 10 lbs. of shavings, 40 lbs. of wood, 130 lbs. of coke, and 350 lbs. of coal.
8.40 "	"	"	Started trial. Engine could not be started owing to ice in the exhaust pipe.
9.50 "	"	"	Engine started.
12.00 p.m.,	"	"	Gas washer cleaned by means of steam jet.
3.15 "	"	"	" " " "
8.15 "	"	"	" " " "
11.00 "	"	"	" " " "
3.15 a.m.,	"	22	" " " "
8.40 a.m.,	"	22	Trial finished.

Notes.

Neither clinker nor arch formed in the fire.

Tar removed from the wet scrubber.	33 lbs.
Tar removed from the gas washer.	1 lb
286 lbs. of wet refuse removed from the producer during the trial	
143 lbs. of this when dried weighed	85 lbs
389 lbs. of wet refuse removed after the trial.	
22[illegible] lbs. of this when dried weighed	148 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 21 and 22, 1909. Trial Number—22.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 a.m....	9·6	2·3	0·7	4·6	5·2	6·9	70·7	17·4
10.00 "	9·8	1·3	0·8	5·8	6·3	9·6	66·4	22·5
11.00 "	10·2	1·5	0·1	8·8	4·4	9·7	65·2	23·0
12.00 p.m....	10·0	1·1	0·3	13·5	2·6	7·0	65·5	23·4
1.00 "	12·0	1·2	0·0	12·1	2·5	12·1	60·1	26·7
2.00 "	12·5	1·0	0·0	11·9	2·9	10·9	60·8	25·7
3.00 "	12·7	1·1	0·2	11·8	3·0	11·6	59·6	26·6
4.00 "	13·8	1·0	0·0	10·5	3·0	13·6	58·1	27·1
5.00 "	12·6	1·3	0·2	9·4	3·9	15·8	56·8	29·3
6.00 "	13·3	1·4	0·4	10·8	2·6	13·1	58·4	26·9
7.10 "	12·4	1·1	0·3	10·9	3·0	15·1	57·2	29·3
8.10 "	12·6	1·3	0·2	9·8	3·0	11·8	61·3	24·8
9.10 "	11·7	0·8	0·0	10·8	4·9	18·3	60·5	27·0
10.10 "	11·7	1·0	0·3	10·7	3·0	12·4	60·9	26·4
11.10 "	8·7	1·1	0·4	11·9	6·2	19·3	53·4	37·8
1.50 a.m....	8·1	1·6	0·4	10·9	4·0	15·5	59·5	30·8
3.10 "	10·8	1·5	0·1	10·0	4·0	12·2	61·4	26·3
4.10 "	12·9	1·0	0·2	9·6	1·7	11·3	63·3	22·8
5.10 "	14·1	1·1	0·2	10·0	2·1	14·5	58·0	26·8
6.10 "	12·8	0·9	0·3	9·5	2·6	14·9	59·0	27·3
7.10 "	12·9	1·0	0·1	15·6	2·5	12·6	55·3	30·8

OBSERVATIONS OF GAS METER AND B.H.P.

Date—January 21 and 22, 1909. Trial Number—22.

Notes—B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings cub. ft.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake. lbs.	lbs.	Net load on brake. lbs.	Revolutions counter reading on side shaft.	Times for brake readings.
8.40 a.m.	1626160	......	N.B.O.	......	......	......	......	......
9.10 “	1627065	905	“	......	......	......	......	......
9.40 “	1628255	1190	“	250	83	167	70166	9.55 a.m.
10.10 “	1629660	1405	“	200	55	145	......	10.25 “
10.40 “	1631370	1710	“	175	50	125	......	10.40 “
11.10 “	1633095	1725	“	250	80	170	......	10.55 “
11.40 “	1634855	1760	“	250	80	170	......	......
12.10 p.m.	1636755	1900	“	250	80	170	76400	12.10 p.m.
12.40 “	1638500	1745	“	......	......	......	......	......
1.10 “	1640330	1830	“	......	......	......	......	......
1.40 “	1642320	1990	“	275	95	180	......	1.40 “
2.10 “	1644270	1950	“	275	95	180		
2.40 “	1646220	1950	“	275	95	180		
3.10 “	1648150	1930	“	275	95	180		
3.40 “	1650015	1865	“	275	95	180		
4.10 “	1651880	1865	“	275	95	180	99301	4.10 “
4.40 “	1653985	2105	“	275	95	180		
5.10 “	1655855	1870	“	275	95	180		
5.40 “	1657610	1755	“	275	95	180		
6.10 “	1659490	1880	“	275	95	180		
6.40 “	1661360	1870	“	275	95	180		
7.10 “	1663165	1805	“	275	95	180		
7.40 “	1665000	1835	“	275	95	180		
8.10 “	1666925	1925	“	275	95	180	25704	8.10 “
8.40 “	1668825	1900	“	275	95	180		
9.10 “	1670810	1985	“	275	95	180		
9.40 “	1672810	2000	“	275	95	180		
10.10 “	1674860	2050	“	275	95	180		
10.40 “	1676730	1870	“	275	95	180		
11.10 “	1678755	2025	“	275	95	180		
11.40 “	1680580	1825	“	275	95	180		
12.10 a.m.	1682200	1620	“	275	95	180		
12.40 “	1684105	1905	“	275	95	180	54470	12.40 a.m.
1.10 “	1685805	1700	“	275	95	180		
1.40 “	1687510	1705	“	275	95	180		
2.10 “	1689435	1925	“	275	95	180		
2.40 “	1691360	1925	“	275	95	180		
3.10 “	1693300	1940	“	275	95	180		
3.40 “	1695195	1845	“	275	95	180		
4.10 “	1697150	2005	“	275	95	180		
4.40 “	1698980	1830	“	275	95	180		
5.10 “	1700935	1955	“	275	95	180	83060	5.10 a.m.
5.40 “	1702940	2005	“	275	95	180		
6.10 “	1704850	1910	“	275	95	180		
6.40 “	1706740	1890	“	275	95	180		
7.10 “	1708670	1930	“	275	95	180		
7.40 “	1710325	1655	“	275	95	180	94515	7.00 a.m.
8.10 “	1712175	1850	“	275	95	180		
8.40 “	1713695	1520	“	275	95	180	05248	..40 a.m.

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—January 21 and 22, 1909. Trial Number—22.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.40 a.m...	55	$\frac{1}{2}$	4·93	14·49	1830	138·3	8.45 a.m.	50	50	9.05 a.m.
9.10 “ ..	54	$\frac{1}{2}$	5·39	12·77	1830	106·4	9.40 “	50	100	9.40 “
9.40 “ ..	53	$\frac{1}{2}$	5·29	13·70	1825	121·5	10·00 “	50	150	9.55 “
10.10 “ ..	56	$\frac{5}{12}$	5·56	13·41	1600	119·4	10.30 “	50	200	10.15 “
10.40 “ ..	Gas not burning.						10.45 “	50	250	10.45 “
11.10 “ ..	58	$\frac{1}{2}$	5·29	13·70	1825	100·0	11.30 “	25	275	11.30 “
11.40 “ ..	60	$\frac{1}{2}$	5·96	13·06	1780	100·0	12.05 p.m.	25	300	12.40 p.m.
12.10 p.m...	61	$\frac{1}{2}$	7·21	15·46	1820	119·0	12 45 “	25	325	....
12.40 “ ..	61	$\frac{5}{12}$	5·80	11·68	1620	90·6	1.00 “	50	375	1.00 “
1.10 “ ..	62	$\frac{5}{12}$	5·95	12·43	1600	98·5	2.30 “	50	425	......
1.40 “ ..	62	$\frac{5}{12}$	6·17	13·11	1600	105·5	3.30 “	50	475	4.20 “
2.10 “ ..	63	$\frac{1}{2}$	6·39	12·83	1400	96·8	5.00 “	100	575	4.53 “
2.40 “ ..	64	$\frac{5}{12}$	6·55	13·79	1610	103·0	7.10 “	50	625	6.40 “
3.10 “ ..	64	$\frac{5}{12}$	6·90	13·27	1630	98·5	8.00 “	75	700	....
3.40 “ ..	66	$\frac{5}{12}$	7·42	14·22	1600	103·4	9.10 “	75	775	8.00 “
4.10 “ ..	66	$\frac{5}{12}$	6·79	13·27	1600	98·6	9.30 “	50	825	9.10 “
4.40 “ ..	66	$\frac{5}{12}$	7·19	13·39	1600	94·4	11.15 “	75	900	11.15 “
5.10 “ ..	67	$\frac{1}{2}$	7·25	14·49	1840	105·5	12.10 a.m.	50	950	12.00 a.m.
5.40 “ ..	67	$\frac{5}{12}$	7·34	19·52	1600	109·2	1.10 “	50	1000	1.10 “
6.10 “ ..	69	$\frac{1}{2}$	7·24	14·39	1800	102·0	1.45 “	75	1075	1.45 “
6 40 “ ..	69	$\frac{1}{2}$	7·16	14·39	1775	100·5	3.15 “	50	1125	2.35 “
7.10 “ ..	69	$\frac{1}{2}$	7·47	15·21	1600	98·0	4.20 “	75	1200	4.15 “
7.40 “ ..	70	$\frac{1}{2}$	7·69	15·11	1700	99·7	4.20 “	25	1225	5.40 “
8.10 “ ..	70	$\frac{1}{2}$	7·76	14·22	1800	92·2	6.10 “	50	1275	6.10 “
8.40 “ ..	70	$\frac{1}{2}$	7·80	14·56	1840	98·3	7.00 “	50	1325	7 00 “
9.10 “ ..	70	$\frac{1}{2}$	7·90	14·23	1870	93·7	8.00 “	50	1375	7.50 “
9.40 “ ..	70	$\frac{5}{12}$	7·64	14·13	1600	98·5				
10.10 “ ..	70	$\frac{5}{12}$	7·80	13·95	1600	93·5				
10.40 “ ..	71	$\frac{5}{12}$	7·85	13·86	1640	93·5				
11.10 “ ..	71	$\frac{5}{12}$	7·72	15·47	1660	90·6				
11.40 “ ..	72	$\frac{5}{12}$	8·75	15·69	1600	108·0				
12.10 a.m...	72	$\frac{5}{12}$	8·57	16·87	1600	126·0				
12.40 “ ..	72	$\frac{5}{12}$	8·67	15·07	1650	100·4				
1.40 “ ..	72	$\frac{5}{12}$	8·43	13·98	1630	85·9				
2.10 “ ..	72	$\frac{5}{12}$	8·54	14·76	1665	98·3				
2.40 “ ..	72	$\frac{5}{12}$	8·67	15·02	1690	102·0				
3.10 “ ..	73	$\frac{5}{12}$	8·66	14·16	1710	89·3				
3.40 “ ..	73	$\frac{5}{12}$	9·07	15·29	1700	100·5				
4.10 “ ..	73	$\frac{5}{12}$	8·90	14·34	1750	90·5				
4.40 “ ..	73	$\frac{5}{12}$	8·85	14·64	1740	95·9				
5.10 “ ..	73	$\frac{5}{12}$	8·91	14·68	1760	96·4				
5.40 “ ..	73	$\frac{5}{12}$	9·07	14·87	1770	97·7				
6.10 “ ..	73	$\frac{5}{12}$	9·08	14·28	1760	87·0				
6.40 “ ..	73	$\frac{5}{12}$	8·87	13·27	1780	76·1				
7.10 “ ..	73	$\frac{5}{12}$	8·94	14·84	1785	100·0				
7.40 “ ..	73	$\frac{5}{12}$	8·87	14·38	1770	92·6				
8.10 “ ..	73	$\frac{5}{12}$	9·43	16·16	1860	119·0				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—January 21 and 22, 1909. Trial Number—22.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 40 a.m.	490	61	55	.	3·0	4·1	4·3	8·9	4·1	2·5	44	41
9 10 "	500	60	53	. .	3·2	4·7	4·9	8·0	2·5	0·8	46	43
9 40 "	550	59	53	. .	3·4	5·7	5·9	6·0	2·9	1·2	73	70
10 10 "	600	62	60	174	3·2	5·7	5·9	5·7	2·9	1·4	67	64
10 40 "	710	64	62	120	3·6	6·9	7·1	8·9	3·3	0·9	66	63
11 10 "	670	65	64	111	3·1	5·9	6·1	8·0	4·1	1·7	72	69
11 40 "	700	66	65	140	3·8	7·3	7·5	9·4	3·7	1·3	56	52
12 10 p.m.	730	66	67	133	3·5	6·3	6·5	8·7	3·8	1·3	64	60
12 40 "	720	69	67	131	3·5	6·2	6·4	7·0	3·5	0·8	64	58
1 10 "	760	70	67	130	3·5	6·8	7·0	8·6	3·8	1·1	72	67
1 40 "	780	69	66	134	3·8	7·1	7·3	8·2	3·7	0·9	66	62
2 10 "	780	68	67	142	3·8	6·8	7·0	7·9	3·5	0·8	71	67
2 40 "	780	68	67	145	3·9	7·2	7·9	8·7	3·5	0·9	61	55
3 10 "	760	68	70	146	3·8	6·7	6·9	7·8	3·4	0·8	63	57
3 40 "	770	70	72	148	3·8	6·5	6·7	7·8	3·4	0·9	68	62
4 10 "	760	72	70	145	3·5	6·5	6·7	7·4	3·4	0·9	66	59
4 40 "	800	70	70	142	3·9	7·4	7·6	9·2	3·9	1·0	59	52
5 10	780	70	70	145	3·5	5·8	6·0	6·7	3·4	0·7	63	57
5 40	[illegible]	70	73	145	3·5	6·3	6·5	7·4	3·6	0·8	60	54
6 10	[illegible]	70	74	145	3·9	6·6	6·8	8·4	3·7	0·9	56	50
6 40 "	[illegible]	70	73	145	3·6	6·1	6·3	7·3	3·5	0·9	46	40
7 10 "	770	70	73	143	3·6	6·4	6·6	7·6	3·1	0·9	54	48
7 40 "	790	70	74	141	3·8	6·5	6·7	8·3	3·9	1·0	56	50
8 10 "	800	70	73	140	3·7	6·5	6·7	8·4	3·8	1·0	57	51
8 40 "	800	73	74	140	3·9	6·7	6·9	8·9	3·8	0·9	49	44
9 10 "	800	73	74	142	3·9	6·7	6·9	9·0	3·8	0·9	53	47
9 40 "	820	71	73	137	3·9	6·8	7·0	9·8	4·1	1·0	56	50
10 10 "	800	70	73	133	3·7	6·5	6·7	8·7	3·9	0·9	41	36
10 40 "	800	70	74	133	3·5	6·2	6·4	8·7	4·0	1·0	28	23
11 10 "	800	71	74	133	3·9	7·3	7·5	10·0	3·9	0·6	29	23
11 40 "	760	76	74	139	3·4	5·5	5·7	6·5	3·4	0·5	31	26
12 10 a.m.	760	76	74	139	3·6	6·4	6·6	8·7	3·9	0·7	40	37
12 40 "	[illegible]	75	75	140	3·7	6·3	6·6	9·2	4·6	0·9	36	32
1 10 "	[illegible]	74	75	135	3·4	6·0	6·2	8·8	3·8	0·8	38	35
1 40 "	700	74	74	132	3·3	5·7	5·9	8·2	3·7	0·6	41	35
2 10 "	790	74	74	134	3·5	6·3	6·5	8·9	4·2	1·0	41	35
2 40 "	800	74	74	133	3·8	6·6	6·8	9·5	4·1	0·8	49	45
3 10 "	780	74	75	137	3·7	6·4	6·6	9·2	3·9	0·6	43	40
3 40 "	770	77	75	135	3·7	6·4	6·6	9·6	4·1	0·7	45	41
4 10 "	770	76	75	128	3·5	5·9	6·1	8·3	3·9	0·6	37	35
4 40 "	800	74	75	129	3·5	6·3	6·5	9·6	4·4	0·9	24	17
5 10 "	810	73	75	138	3·8	6·7	6·9	10·0	4·3	0·9	31	22
5 40 "	830	73	76	138	3·9	6·7	6·9	10·1	4·2	0·8	38	30
6 10 "	820	72	75	132	3·7	6·3	6·5	9·0	3·9	0·7	35	28
6 40 "	830	72	75	137	3·7	6·3	6·5	9·1	5·0	0·8	36	31
7 10 "	820	72	75	135	3·8	6·4	6·6	9·7	4·1	0·8	44	40
7 40 "	800	72	74	130	3·3	5·4	5·6	7·7	3·6	0·6	37	35
8 10 "	810	73	72	132	3·6	5·9	6·1	8·8	3·9	0·7	44	40
8 40 "	790	72	70	131	3·2	5·0	5·2	6·3	3·9	0·6	50	54

PRODUCER TRIAL No. 22.

Date—January 21-22, 1909. Producer No. 4, at McGill University.
Time of lighting up—3.40 a.m. Trial commenced 8.40 a.m. January 21; ended 8.40 a.m. January 22.
Duration of trial—24 hours. Kind of fuel—No. 5 coal.
Observers and staff during trial—Cameron, Killam, Gardner.
Computers—Cameron, Killam.
Chemists—Stansfield, Nicolls, Campbell.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1375
2.	Moisture in coal as charged	per cent.	1·9
3.	Calorific value of coal as charged, per lb	B.T.U.	13120
4.	" " of dry coal per lb	B.T.U.	13370
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 59·4; volatile matter, 31·4; ash, 7·3; moisture, 1·9	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 58·8; volatile matter, 6·0	Total per cent.	64·8
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	42·0

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft	87535
9.	Average temperature of gas leaving producer	°F.	757
10.	" " " at meter	°F.	70
11.	Average temperature of air in producer house	°F.	70
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	100·7
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	104·0
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	93·8
14.	Average barometric pressure	lbs sq. in.	14·62
15.	" suction at producer	ins. of water	0·9
16.	" suction at exhauster	ins. of water	8·4
17.	" pressure of gas at meter	ins. of water	4·9

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2400
19.	" water used in scrubber and gas washer	lbs.	40680
20.	" tar extracted in scrubber and gas washer	lbs.	34
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		312450
24.	Average explosions per minute		99·3
25.	Average effective load on brake	lbs	174·7
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	63·8

28. **Notes.**

Fire poked at: 9.05, 9.40, 9.55, 10.15, 10.45, 11.30 a.m.; 12.40, 1.00, 4.20, 4.55, 6.40, 8.00, 9.10, 11.15, 12.00 p.m.; 1.10, 1.45, 2.35, 4.15, 5.40, 6.10, 7.00, 7.50 a.m.

Refuse removed at: 9.55 a.m.; 12.40, 4.20, 4.45, 5.00, 7.10, 7.45, 9.10, 10.40, 11.15 p.m.; 1.00, 2.10, [illegible], 5.10, 7.40 a.m.

Behaviour of coal: Easily worked.
Average time between poking: 58 minutes.
Clinker: None.
Tar: No trouble
State of engine valves at end of trial: Clean.
Valves last cleaned: Jan. 20, 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·9%
Carbon	75·1%
Nitrogen	1·2%
Oxygen	8·0%
Sulphur	1·6%
Total carbon contained by dry coal charged	1012·0 lbs.

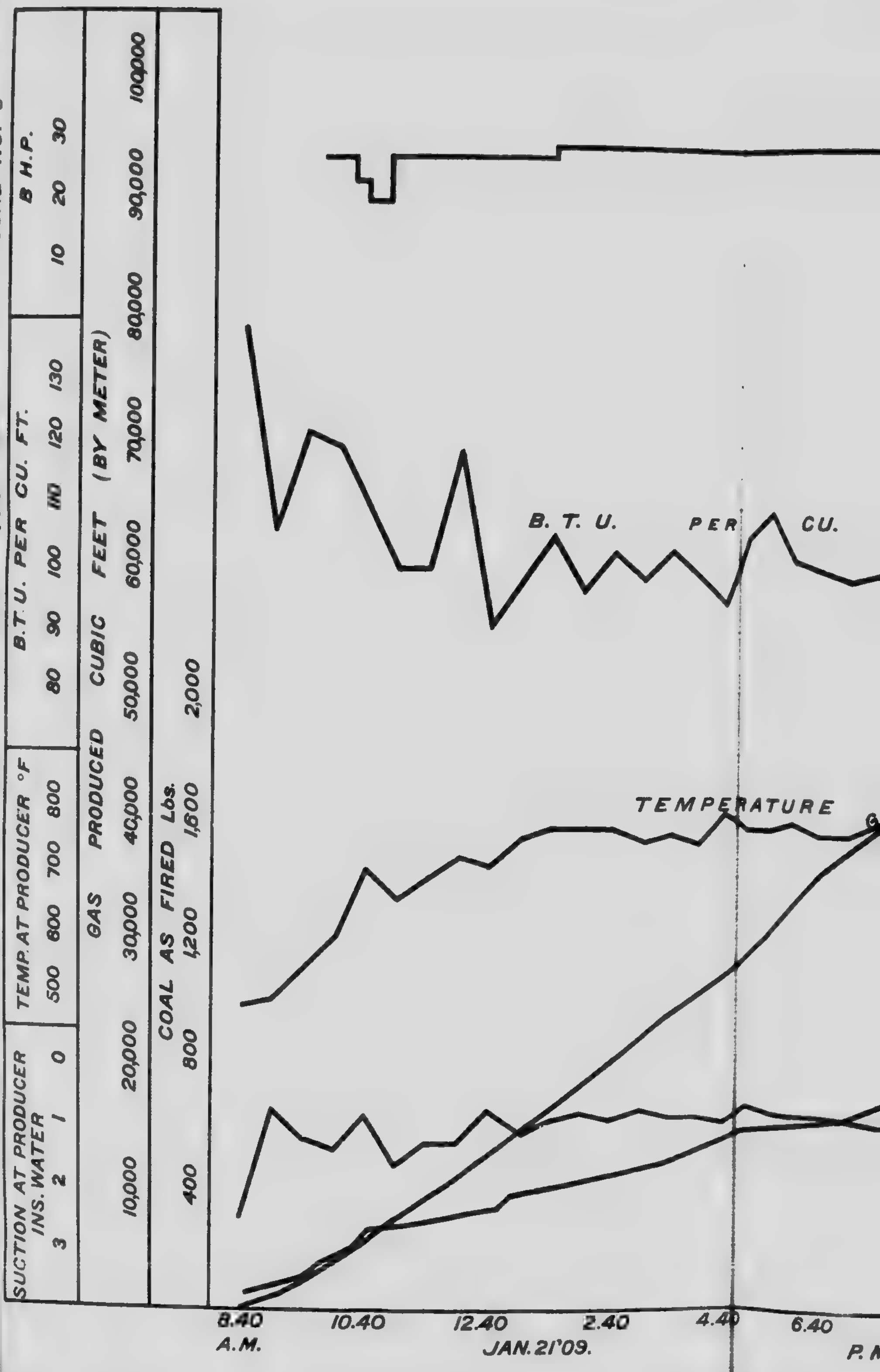
30. ANALYSIS OF GAS BY VOLUME.

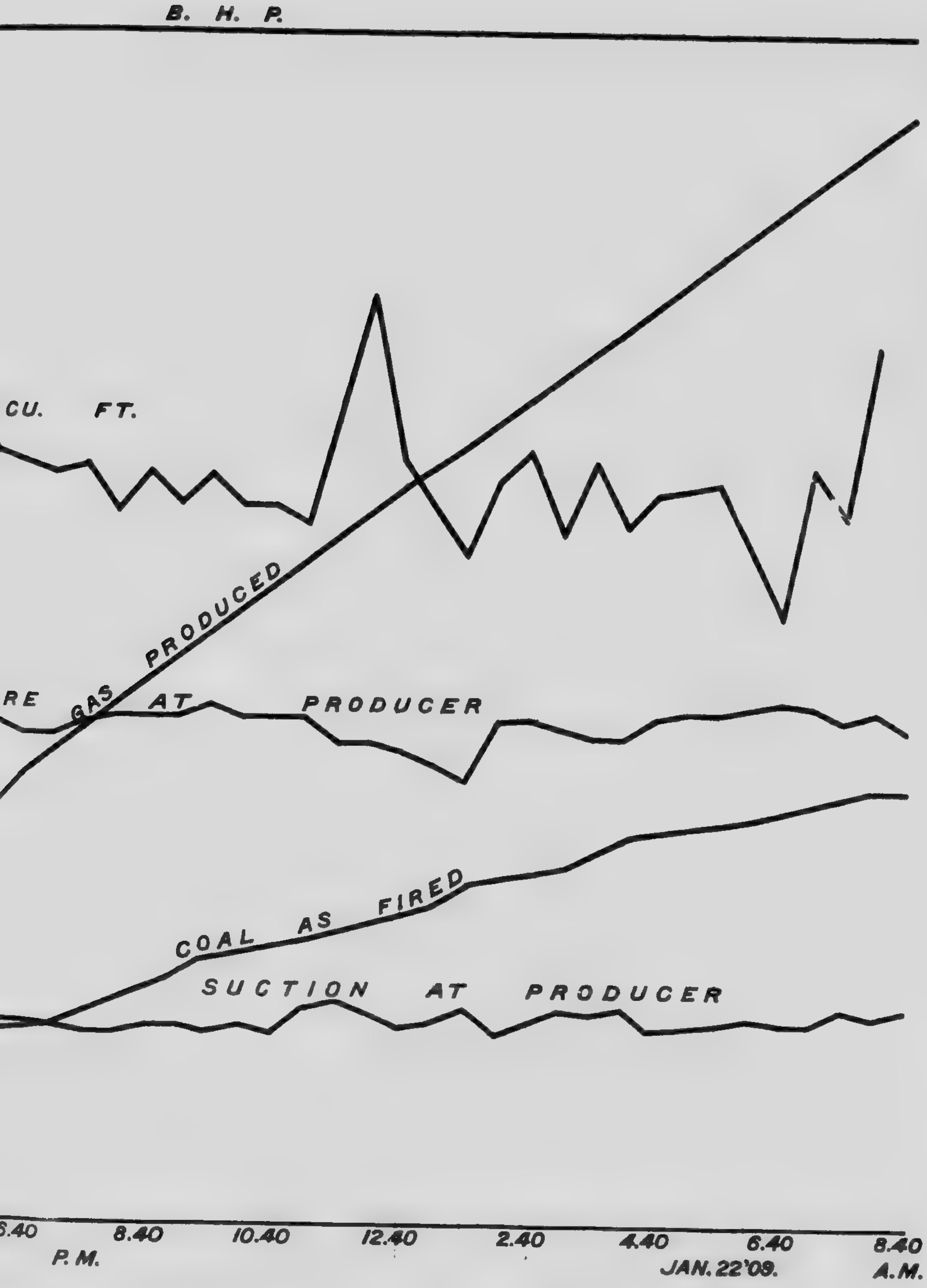
Carbon dioxide	11·7%
Oxygen	1·2%
Carbon monoxide	10·4%
Hydrogen	12·4%
Methane	3·5%
Ethylene	0·2%
Nitrogen	60·6%

PRODUCER TRIAL NO. 22 COAL NO. 5.

PRODUCER TRIAL NO. 22

COAL NO. 5





APPENDIX III VOL.V

2

REMARKS.

This coal gives off a poor quality of gas, which did not enable the engine to carry full load. The coal is easy to work in the producer but it requires a good deal of attention, no clinker or arch was formed in the fire and the engine valves were not coated by tar.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31. Dry coal charged during trial..........
32. Combustible charged during trial.......... lbs. 1348
33. Average B.H.P. of engine during trial...... lbs. 1250
34. " indicated H.P. of engine during trial... H.P. 27·67
35. " H.P. taken by exhauster and gas washer... H P. 36·25
36. " B.H.P. while gas consumption of engine was taken.. H.P. 4·0
37. " " corresponding to total gas produced..... H.P. 27·67
38. " " " " " " and available for outside use, allowing for power used H.P. 27 67
H.P. 23·67

HOURLY QUANTITIES.

39. Coal charged per hour..
40. Dry coal charged per hour.......... lbs. 57·3
41. Combustible charged per hour.......... lbs. 56·2
42. Coal charged per sq. ft. of fuel bed per hour....... lbs. 52·1
43. Dry coal charged per sq. ft. of fuel bed per hour.... lbs. 14·3
44. Combustible charged per sq ft. of fuel bed per hour ..... lbs. 14·0
45. Coal (as charged) per hour equivalent to power used for auxiliaries lbs. 13·0
46. Coal (as charged) per hour equivalent to steam used in producer . lbs. 8·28
47. Gas (by meter) supplied by producer per hour..... lbs. 12·25
48. Gas (dry at 60° and 14·7 lbs. per sq. in) supplied by producer per hour...... cub. ft. 3645
49. Gas (by meter) supplied to engine per hour while gas consumption was taken.......... cub. ft. 3512
50. Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken.......... cub. ft. 3645
51. Calorific value of coal charged per hour.......... cub. ft. 3512
52. " " gas produced per hour (lower value)........... B.T.U. 752000
53. Steam used in producer per hour.......... B.T.U. 329000
lbs. 100

ECONOMIC RESULTS.

54. Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged..........
55. Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged cub. ft. 61·3
56. Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged.......... cub. ft. 62·5
57. Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.... cub. ft. 67·4
58. " " " " " " B.H.P. " cub. ft. 96·9
59. Steam used in producer per lb. coal charged.......... cub. ft. 126·9
60. Water used in scrubber and gas washer per lb. coal charged...... lbs. 1·75
61. Water used in scrubber and gas washer per 1000 cub. ft. gas produced.......... lbs. 29·5
62. Efficiency of process of gas production and cleaning, based on coal charged.......... lbs. 461·0
63. Efficiency of producer plant allowing for power used for auxiliaries per cent. 43·8
64. Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer.......... per cent. 37·4
65. Thermal efficiency of engine, based on B.H.P...... per cent. 30·8
66. Over all efficiency of producer and engine plant...... per cent. 21·4
67. Calorific value of gas supplied to engine per B.H.P. per hour...... per cent. 9·36
68. " " coal charged into producer per B.H.P. per hr.. B.T.U. 11900
B.T.U. 27160

	Coal as charged.	Dry coal.	Combustible.
69. Pounds per hour charged into producer per B.H.P. developed by engine..........	2·07	2·03	1·88
70. Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries..........	2·42	2·37	2·20
71. Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·94	2·88	2·67

JOGGINS CHIGNECTO COAL FIELD.

CUMBERLAND CO., NOVA SCOTIA.

TRIAL OF No. 4 PRODUCER WITH COAL No. 10

Date—February 18 and 19, 1909

Trial Number - 27.

OBSERVATIONS OF GENERAL CONDITIONS

General Notes.

Barometer at beginning of trial	[illegible]
" 9 p.m., Feb. 18	[illegible]
" " end of trial.	[illegible]
Water meter reading at 9 a.m., Feb. 18	81,061 cubic feet [illegible]
" " 8 a.m., " 19	83,970
Difference, in 23 hours	2,909
Brick in producer base	910 lbs.
Average level of fuel below top plate of producer	18 [illegible]

TIME.				
3.30	a.m.,	Feb.	18	Started fire with 10 lbs. of shavings, 70 lbs. of wood, 140 lbs. [illegible] coke.
6.00	"	"	"	Down-draft with fan exhausting directly to the atmosphere
6.00	"	"	"	Charged 75 lbs. of coal
6.30	"	"	"	" 75 "
7.30	"	"	"	" 75 "
8.00	"	"	"	" 100 "
8.15	"	"	"	" 50 "
8.25	"	"	"	Down-draft with blower
8.35	"	"	"	Started engine.
8.40	"	"	"	Charged 50 lbs. of coal
8.45	"	"	"	Started trial.
1.50	p.m.	"	"	Steam blown through gas-washer
3.00	a.m.,	"	19	" " "
4.30	"	"	"	" "
8.45	"	"	"	Trial finished.

A slight trace of tar was noticed at the engine inlet valve after running 15 hours

Tar removed from wet scrubber	
Tar removed from gas washer	[illegible] lbs.
[illegible] lbs. of wet refuse removed from the producer during the trial	[illegible]
237 lbs. of this when dried weighed	
1055 lbs. of wet refuse removed after the trial	[illegible]
301 lbs. of this refuse when dried weighed	[illegible]

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—February 18 and 19, 1909. Trial Number—27.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m.	10·5	1·0	0·1	11·2	2·5	8·5	66·2	22·3
10 05 "	10·7	0·8	0·4	10·9	4·4	8·9	63·9	24·6
11 00 "	10·9	0·8	0·2	10·9	3·1	9·7	64·4	23·9
12.00 noon. . . .	10·6	1·1	0·3	10·3	3·1	11·0	63·6	24·7
1.05 p.m.	11·9	0·8	0·1	9·2	4·3	13·1	60·6	26·7
2.00 "	11·4	0·8	0·0	13·0	2·4	12·7	59·7	28·1
3.00 "	8·8	0·8	0·2	14·5	1·7	10·7	62·3	27·1
4.00 "	9·1	0·8	0·1	16·6	2·0	6·8	64·6	25·5
5.00 " . . .	11·1	0·7	0·3	10·1	2·5	8·2	67·1	21·1
7.30 " . . .	8·5	0·9	0·0	12·1	2·9	11·0	64·6	26·0
8.45 " . . .	9·4	0·6	0·0	14·1	2·4	9·8	63·1	26·9
10.30 "	14·0	0·6	0·2	10·3	2·9	16·0	56·0	29·4
11.45 "	9·6	0·6	0·2	15·7	2·4	10·5	61·0	28·8
1.30 a.m.	10·4	0·8	0·0	12·8	2·8	15·8	57·4	31·4
3 00 "	9·8	0·8	0·2	10·7	3·8	14·6	60·1	29·3
4.30 "	9·6	0·1	0·1	13·8	2·4	6·5	66·9	22·8
6.00 "	11·5	0·8	0·0	12·3	2·2	13·1	60·1	27·6
7.30 "	9·5	0·6	0·1	13·2	2·0	10·4	64·2	25·7
8.30 "	9·3	0·9	0·0	17·4	1·6	4·6	76·2	23·6

OBSERVATIONS OF GAS METER AND B. H. P.

Date—February 18 and 19, 1909. Trial Number—27.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. ndicates that all the gas is passing to gas engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
8.45 a.m.	2070025	......	N.B.O.	....	275	92	183	33031
9 15 "	2072080	1955	"		275	92	183	
9 45 "	2073755	1675	"		275	92	183	
10 15	2075490	1735	"		275	105	170	
10 45 "	2077280	1790	"		275	105	170	
11 15 "	2079115	1835	"		275	105	170	
11 45 "	2080940	1825	"		275	105	170	
12 15 p.m.	2082540	1600	"		275	105	170	
12 45 "	2084310	1770	"		275	105	170	56349
1 15 "	2086075	1765	"		275	100	175	
1 45 "	2087540	1465	"		275	100	175	
2 15 "	2089275	1735	"		275	100	175	
2 45 "	2090980	1705	"		275	100	175	
3 15 "	2092650	1670	"		275	100	175	
3 45 "	2094340	1690	"		275	100	175	
4 15 "	2096065	1725	"		275	100	175	
4 45 "	2097690	1625	"		275	105	170	
5 15 "	2099350	1660	"		275	105	170	86461
5 45 "	2101025	1675	"		275	105	170	
6 15 "	2102680	1658	"		275	105	170	
6 45 "	2104325	1645	"		275	105	170	
7 15 "	2105825	1500	"		275	105	170	
7 45 "	2107370	1545	"	8.00 p.m.	275	105	170	
8 15 "	2108800	1430	"		275	105	170	
8 45 "	2110490	1690	"		275	105	170	
9 15 "	2112160	1670	"		275	105	170	
9 45 "	2113850	1690	"		275	105	170	
10 15 "	2115560	1710	"		275	100	175	
10 45 "	2117120	1560	"		275	100	175	
11 15 "	2118710	1590	"		275	100	175	
11 45 "	2120225	1515	"		275	100	175	
12 15 a.m.	2121860	1635	"		275	100	175	
12 45 "	2123555	1695	"		275	100	175	
1 15 "	2125095	......	"	1.00 a.m.	275	100	175	
1 45 "	2126680	1585	"		275	100	175	
2 15 "	2128235	1555	"		275	100	175	
2 45 "	2129800	1565	"		275	100	175	
3 15 "	2131350	1550	"		275	100	175	
3 45 "	2132920	1570	"		275	100	175	
4 15 "	2134640	1720	"		275	100	175	
4 45 "	2136425	1785	"	4 30 p.m.	275	100	175	
5 15 "	2138100	1675	"		275	100	175	
5 45 "	2140010	1810	"	5.30 p.m..	275	100	175	
6 15 "	2141700	1690	"		275	100	175	
6 45 "	2143400	1700	"		275	100	175	
7 15 "	2145090	1690	"		275	100	175	
7.45 "	2146915	1825	"		275	100	175	
8 15 "	2148825	1910	"		275	100	175	
8 45 "	2150655	1830	"		275	100	175	93031

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—February 18 and 19, 1909. Trial Number—27.

Note: Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.45 a.m.										
9.15 “	54	5/12	3·02	8·58	1685	89·0				
9.45 “	54	5/12	2·93	8·67	1670	91·1				9.20
10.15 “	54	7/12	2·95	11·56	1700	99·4	10.05	50	50	10.05
10.45 “	54	7/12	3·03	11·89	1680	101·2	10·45	50	100	10.45
11.15 “	54	½	3·24	10·39	1610	91·2	11.30	75	175	
11.45 “	54	½	3·26	12·96	1680	129·0				11.40
12.15 p.m.	54	½	3·40	10·44	1640	91·5	12.30	50	225	12.30
12.45 “	55	½	3·48	11·73	1640	107·2	12.55	75	300	12.45
1.15 “	55	½	3·62	12·79	1640	119·2				
1.45 “	56	½	3·77	11·43	1630	98·9	1.50	50	250	
2.15 “	56	½	3·70	11·20	1820	108·2				
2.45 “	56	5/12	4·01	10·57	1735	107·3	2.40	50	400	
3.15 “	56	5/12	4·46	18·08	1640	132·6	3.15	50	450	3.15
3.45 “	57	5/12	4·51	14·38	1720	100·8				
4.15 “	57	5/12	4·43	15·38	1790	116·5	4.15	50	500	
4.45 “	58	7/12	4·47	13·00	1640	95·0				4.45
5.15 “	58	7/12	4·48	13·98	1770	114·3	5.10	75	575	
5.45 “	59	½	4·75	12·37	1640	99·0				
6.15 “	59	½	4·71	12·00	1640	94·7	6.20	50	625	
6.45 “										
7.15 “	59	½	4·52	12·52	1865	118·0	7.10	75	700	
7.45 “	59	½	4·49	11·63	1820	103·0	7.50	50	750	
8.15 “	58	½	4·72	12·45	1770	108·5	8.15	75	825	8.15
8.45 “	59	½	4·69	12·23	1800	107·6				
9.15 “	58	½	4·52	11·52	1845	102·3				
9.45 “	59	½	4·78	13·53	1800	124·8				
10.15 “		½					10.10	50	875	
10.45 “	60	½	5·59	14·59	1635	116·5	10.30	50	925	
11.15 “	60	½	5·60	14·66	1640	117·6	10.45	50	975	
11.45 “	60	½	4·90	13·38	1625	109·3				
12.15 a.m.		½					12.30	50	1025	
12.45 “	61	½	5·29	14·53	1610	117·8				
1.15 “	61	½	5·28	12·58	1635	95·2	1.20	50	1075	
1.45 “	61	½	7·21	13·41	1630	106·0				
2.15 “	61	½	5·22	14·00	1600	111·4	2.15	50	1125	
2.45 “	62	½	5·88	15·52	1605	122·5	2.45	50	1175	
3.15 “	62	½	6·25	14·46	1635	106·5				
3.45 “	62	½	5·74	13·51	1605	97·8	3.35	50	1225	
4.15 “	62	½	5·93	13·69	1650	101·4				
4.45 “	62	½	7·01	15·61	1620	110·4	4.35	75	1300	
5 15 “	62	½	5·43	13·32	1630	102·0				
5.45 “	61	½	5·24	12·72	1775	103·5	5.40	50	1350	
6.15 “	61	½	5·50	12·51	1700	94·3				
6.45 “	61	5/12	5·76	11·36	1655	88·1				
7 15 “	59	5/12	4·36	9·90	1790	94·2	7.10	50	1400	
7 45 “	59	5/12	4·30	9·36	1785	85·5	7.50	25	1425	
8.15 “	59	5/12	5·01	10·09	1885	91·0				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—February 18 and 19, 1909. Trial Number—27.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet	Gas Me	B	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.45 a.m.	780	55	48	120	3·6	6·2	6·8	9·0	8·0	1·2	47	43
9.15 "	840	54	50	122	3·6	6·2	6·8	9·8	8·6	2·4	60	57
9.45 "	820	55	52	131	3.5	5.2	5·4	7·4	6·7	1·3	62	59
10.15 "	860	55	52	131	3·6	5·7	5·9	8·7	7·2	1·8	55	52
10.45 "	890	56	54	135	3·6	6·1	6·3	7·8	7·3	1·3	63	60
11.15 "	860	57	54	136	3·6	6·1	6·3	8·8	7·3	1·7	62	59
11.45 "	870	58	56	142	3·4	5·6	5·8	7·3	6·8	1·5	57	54
12 15 p.m.	820	58	56	141	3·5	5·7	5·9	8·5	7·1	1·7	50	46
12.45 "	850	60	58	144	3.5	5.7	5·9	9·2	7·5	2·4	56	53
1.15 "	860	60	58	140	3·4	5·2	5·4	8·5	5·9	1·3	60	57
1 45 "	830	60	59	140	3·3	4·8	5·0	6·5	5·3	1·2	56	52
2.15 "	830	63	58	144	3·6	5·8	5·0	7·9	7·0	1·7	55	52
2 45 "	810	64	58	146	3.5	5·2	5·4	7·7	6·8	2·2	66	63
3 15 "	840	65	59	146	3·2	4·6	4·8	8·8	6·1	1·6	68	65
3 45 "	830	64	60	150	3·5	4·9	5·1	8·0	7·1	1·5	51	48
4.15 "	840	64	60	148	3·3	4·4	4·6	7·7	7·0	1·6	59	56
4.45 "	780	64	60	148	3·4	4·3	4·5	7·6	6·5	1·7	60	57
5 15 "	810	63	60	144	3·5	4·4	4·6	7·8	7·1	1·6	56	53
5 45 "	790	64	62	144	3·6	6·3	6·5	8·0	7·1	2·5	50	47
6 15 "	790	64	61	143	3·5	5·9	6·1	8·0	7·1	2·5	30	26
6 45 "	800	64	62	148	3·6	5·9	6·1	8·0	7·0	2·3	50	47
7 15 "	780	64	61	144	3·4	5·8	6·0	8·0	7·1	2·6	45	41
7 45 "	790	63	60	150	3·4	5·3	5·5	6·7	5·8	3·2	64	61
8 15 "	800	64	60	150	3·4	5·8	6·0	8·8	7·7	2·0	45	41
8.45 "	800	64	60	146	3·6	6·1	6·3	9·3	8·2	2·3	62	58
9 15 "	790	64	60	147	3·6	6·3	6·5	9·0	8·0	2·2	64	60
9 45 "	780	64	60	148	3·5	6·2	6·4	9·0	7·8	1·9	48	45
10 15 "	770	64	61	144	3·6	5·8	6·0	9·2	7·3	1·7	53	49
10 45 "	850	65	63	148	3·4	5·7	5·9	8·3	7·1	1·4	70	67
11 15 "	780	65	64	154	3·4	4·8	5·0	6·4	5·4	1·2	62	58
11 45 "	760	64	64	154	3·4	5·6	5·8	7·7	6·6	1·5	50	47
12 15 a.m	770	64	64	155	3·4	5·7	5·9	8·9	7·3	1·7	51	47
12 45 "	770	64	64	156	3·4	5·3	5·5	8·0	7·1	1·6	56	53
1 15 "	780	63	64	148	3·5	5·5	5·7	8·7	7·6	1·5	47	51
1 45 "	780	63	64	142	3·5	5·5	5·7	8·7	7·6	1·4	46	41
2 15 "	780	63	64	143	3·5	5·4	5·6	8·7	7·7	1·8	57	53
2 45 "	800	63	64	145	3·4	5·2	5·4	7·8	7·0	1·7	60	57
3 15 "	770	63	64	142	3·4	5·1	5·3	8·8	7·7	1·6	78	73
3 45 "	820	66	64	138	3·5	5·3	5·5	9·5	8·4	1·9	68	64
4 15 "	820	66	64	139	3·6	5·6	5·8	9·7	8·8	1·7	70	66
4 45 "	810	65	64	138	3·6	5·7	5·9	9·8	8·7	1·5	30	26
5 15 "	800	67	64	139	3·6	5·3	5·5	9·7	8·6	1·4	28	25
5.45 "	800	67	64	138	3·6	5·4	5·6	9·8	8·5	1·4	16	10
6 15 "	810	67	64	140	3·6	5·3	5·5	9·3	8·1	1·3	16	10
6 45 "	800	67	64	139	3·5	5·4	5·6	9·1	8·0	1·4	60	57
7 15 "	820	64	59	133	3·7	5·2	5·4	12·0	10·6	2·1	71	68
7 45 "	800	61	58	134	3·5	5·0	5·2	8·8	7·7	1·6	75	72
8.15 "	820	60	59	140	3·7	6·2	6·4	10·2	9·0	1·9	50	47
8.45 "	800	60	58	139	3·7	6·1	6·3	9·8	8·8	1·9	47	44

PRODUCER TRIAL No. 27.

Date—February 18-19, 1909. Producer No. 4, at McGill University.
Time of lighting up—3.30 a.m. Trial commenced 8.45 a.m. February 18; ended 8.45 a.m. February 19.
Duration of trial—24 hours. Kind of fuel—No. 10 coal.
Observers and staff during trial—Killam, Cameron, Gardner.
Computers—Killam, Cameron.
Chemists—Campbell, Stansfield, Nicolls.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial	lbs.	1425
2.	Moisture in coal as charged	per cent.	2·5
3.	Calorific value of coal as charged, per lb.	B.T.U.	11300
4.	" " of dry coal per lb.	B.T.U.	11590
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 45·0; volatile matter, 34·4; ash, 18·1; moisture, 2·5	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 43·0; volatile matter, 5·8	Total per cent.	48·8
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	42

Gas.

8.	Total gas produced during trial (from meter readings)	cub. ft.	80530
9.	Average temperature of gas leaving producer	°F.	769
10.	" " " at meter	°F.	62·5
11.	Average temperature of air in producer house	°F.	60
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	105·5
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	107·2
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	98·9
14.	Average barometric pressure	lbs. sq in.	14·66
15.	" suction at producer	ins. of water	1·8
16.	" suction at exhauster	ins. of water	8·6
17.	" pressure of gas at meter	ins. of water	4·4

Steam, Water, Etc.

18.	Total steam used in producer during trial	lbs.	2110
19.	" water used in scrubber and gas washer	lbs.	36115
20.	" tar extracted in scrubber and gas washer	lbs.	11
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

Engine.

23.	Total revolutions during trial (from counter)		320000
24.	Average explosions per minute		101·6
25.	Average effective load on brake	lbs.	173·6
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	67·2

28. **Notes.**

Fire poked at: 9.20, 10.05, 10.45, 11.40 a.m.; 12.30, 12.45, 3.15, 4.45, 8.15, 9.45, 10 30 p.m.; 4.10, 4.30 a.m.
Refuse removed at: 10.20, 10.45 a.m.; 12.40, 8.15, 9.50, 10.20 p.m.; 2.15, 2.50, 3.45, 4.10, 6.00, 7.05 a.m.
Behaviour of coal: Fairly good for producer work
Average time between poking: 1 hour, 51 minutes.
Clinker: No clinker present.
Tar: Very little.
State of engine valves at end of trial: Fairly clean.
Valves last cleaned: Jan. 29, 1909.

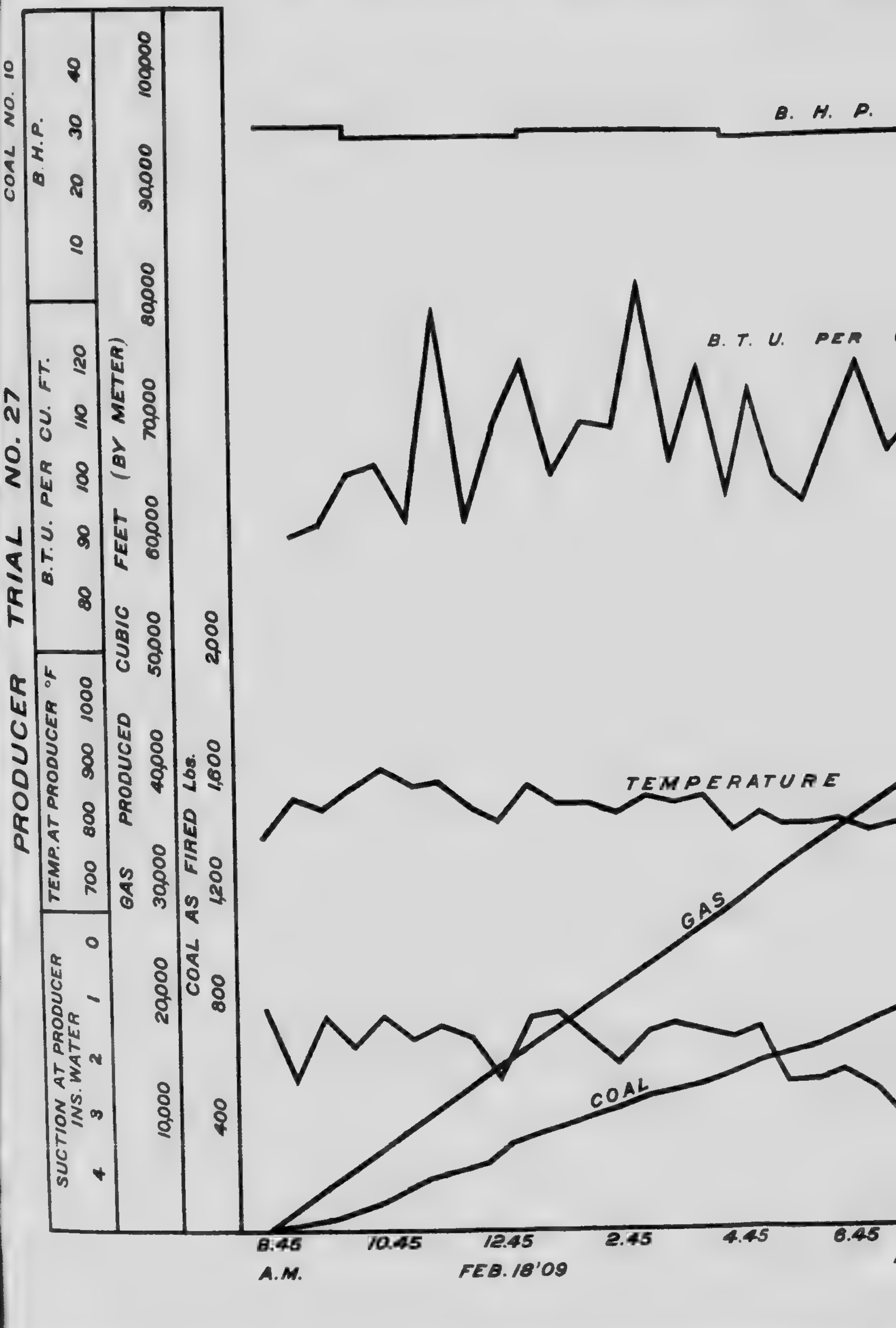
29. Analysis of Dry Coal.

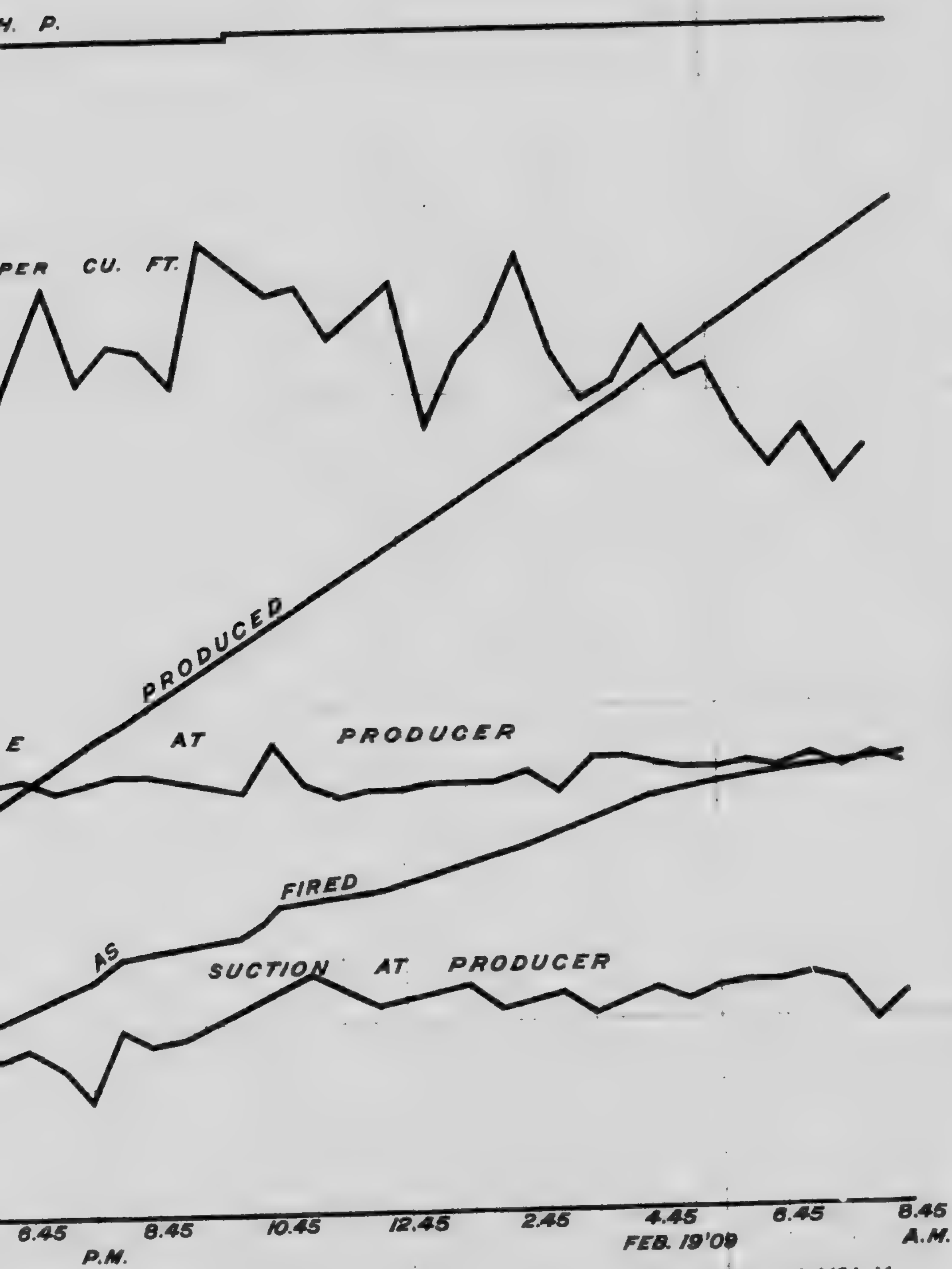
Hydrogen	4·1%
Carbon	63·5%
Nitrogen	1·3%
Oxygen	7·1%
Sulphur	5·4%
Total carbon contained by dry coal charged	882·5 lbs.

30. Analysis of Gas by Volume.

Carbon dioxide	10·4%
Oxygen	0·8%
Carbon monoxide	12·1%
Hydrogen	10·6%
Methane	2·7%
Ethylene	0·1%
Nitrogen	63·3%

PRODUCER TRIAL NO. 27 COAL NO. 10


COAL NO. 10
PRODUCER TRIAL NO. 27
B.H.P.
10 20 30 40
B.T.U. PER CU. FT.
80 90 100 110 120
TEMP. AT PRODUCER °F
700 800 900 1000
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600 2,000
B. H. P.
B. T. U. PER
TEMPERATURE
GAS
COAL
8.45 10.45 12.45 2.45 4.45 6.45
A.M.
FEB. 18'09



APPENDIX III VOL.V

REMARKS.

Gas of low calorific value, but enabled the engine to run with very little attention during the whole trial. There seemed to be a lot of dirt and tar coming from the wet scrubber and a slight trace of tar was noticed in the engine inlet valve after running 15 hours. No arch or clinker was present in fire although the suction at the producer was rather higher than usual.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1389
32.	Combustible charged during trial	lbs.	1130
33.	Average B.H.P. of engine during trial	H.P.	28·16
34.	“ indicated H.P. of engine during trial	H.P.	39·00
35.	“ H.P. taken by exhauster and gas washer	H.P.	4·0
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	28·16
37.	“ “ “ corresponding to total gas produced	H.P.	28·16
38.	“ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	24·16

HOURLY QUANTITIES

39.	Coal charged per hour	lbs.	59·4
40.	Dry coal charged per hour	lbs.	57·9
41.	Combustible charged per hour	lbs.	47·1
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	14·9
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	14·5
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	11·8
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	8·44
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	12·95
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3354
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3304
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3354
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3304
51.	Calorific value of coal charged per hour	B.T.U.	671000
52.	“ “ gas produced per hour (lower value)	B.T.U.	327000
53.	Steam used in producer per hour	lbs.	88·0

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	55·6
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	57·0
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	70·1
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	84·7
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	117·2
59.	Steam used in producer per lb. coal charged	lbs.	1·48
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	25·3
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	448·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	48·6
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	41·7
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	34·2
65.	Thermal efficiency of engine, based on B.H.P	per cent.	22·0
66.	Over all efficiency of producer and engine plant	per cent.	10·67
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	11580
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	23840

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·11	2·06	1·67
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·46	2·40	1·95
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·[illegible]	2·92	2·38

GRAND LAKE COAL FIELD.

QUEENS CO., NEW BRUNSWICK.

TRIAL OF No. 4 PRODUCER WITH COAL No. 11

Date—February 25 and 26, 1909. Trial Number—29

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29 23 inches
" " 8 30 p m . Feb . 25.	29 61 "
" " end of trial	29 79 "
Water meter reading at 8 45 a.m., Feb. 25.	87,851 imperial gallons
" " " 8.15 a.m., " 26	90,383 " "
Difference, in 23½ hours	2,532 " "
Brick in producer base	920 lbs.
Average level of fuel below top plate of producer	17 inches

TIME				
4 30	a.m.,	Feb.	25	Started fire with 10 lbs. of shavings, 60 lbs. of wood, 153 lbs. of coke
5 30	"	"	"	Down-draft with fan exhausting directly to the atmosphere.
5 45	"	"	"	Charged 63 lbs. of coal.
6 15	"	"	"	" 117 "
8 15	"	"	"	Down-draft with blower
8 25	"	"	"	Started engine.
8 30	"	"	"	Started trial.
7 30	p.m.,	"	"	Gas washer blown through with steam.
12 45	a.m.,	"	26	" " "
4 30	"	"	"	" " "
6 40	"	"	"	" " "
8 30	"	"	24	Trial finished

Notes.

Tar removed from wet scrubber	107 lbs
Tar removed from gas washer	7 "
Tar removed from seals, etc.	5 "
Wet refuse removed from the producer during the trial	278 "
139 lbs of this when dried weighed	92 "
Wet refuse removed at the end of the trial	1,300 "
220 lbs of this when dried weighed	139

It was not necessary to clean the valves after this trial

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—February 25 and 26, 1909. Trial Number—29.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.06 a.m....	10·6	0·7	0·0	13·2	2·0	7·8	65·7	23·0
10.00 "	8·5	0·8	0·4	15·8	2·9	5·9	65·9	24·8
11.00 "	9·3	0·6	0·1	10·6	4·0	11·2	64·2	25·9
12.30 p.m....	8·2	0·4	0·2	15·9	2·4	9·4	63·5	27·9
1.45 "	7·8	0·7	0·2	11·0	4·3	15·7	60·3	31·2
2.45 "	9·5	0·5	0·1	16·3	2·4	8·4	62·8	27·2
3.45 "	8·5	0·6	0·2	19·4	2·3	5·3	63·7	27·2
4.45 "	9·3	0·5	0·1	14·4	2·8	10·5	62·4	27·8
6.00 "	5·6	0·5	0·1	20·0	3·4	16·5	53·9	40·0
7.30 "	5·2	9·3						
8.30 "	11·7	0·8	0·1	12·0	3·3	10·0	62·1	25·4
9.30 " ...	10·2	0·5	0·1	14·1	2·5	10·1	62·5	26·8
10.30 " ...	7·4	0·5	0·3	14·8	6·4	21·5	49·1	43·0
11.30 " ...	9·2	0·5	0·3	11·7	4·1	14·1	60·1	30·2
1.00 a.m....	10·3	0·5	0·1	9·8	3·7	15·9	59·7	29·5
	9·9	0·6	0·1	14·4	3·2	15·1	56·7	32·8
4.00 "	11·1	0·4	0·0	13·2	2·4	12·2	60·7	27·8
5.30 "	10·1	0·3	0·3	11·7	2·9	15·3	59·0	30·2
7.00 "	9·1	0·7	0·4	8·5	5·5	13·3	62·5	27·7

OBSERVATIONS OF GAS METER AND B.H.P.

Date—February 25 and 26, 1909. Trial Number—29.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the **gas** is passing to gas engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
8.30 a.m.	2189250				275	100	175	75590
9.00 "	2191180	1930	N.B.O.					
9.30 "	2193220	2040	"		225	90	135	
10.00 "	2195260	2040	"		225	90	135	85320
10.30 "	2197100	1840	"	9.45	200	75	125	
11.00 "	2199100	2000	"		225	85	140	
11.30 "	2200700	1600	"		225	85	140	
12.00 p.m.	2202400	1700	"		225	85	140	
12.30 "	2204330	1930	"		225	85	140	
1.00 "	2206140	1810	"		225	85	140	
1.30 "	2207780	1640	"		225	85	140	09260
2.00 "	2209500	1720	"		225	85	140	
2.30 "	2211320	1820	"		225	85	140	
3.00 "	2213050	1730	"		225	85	140	
3.30 "	2214750	1700	"		225	85	140	
4 00 "	2216430	1680	"		225	85	140	26340
4.30 "	2218080	1650	"		225	85	140	
5 00 "	2219780	1700	"		250	90	160	
5.30 "	2221260	1480	"		250	90	160	
6.00 "	2222860	1600	"		275	115	160	
6.30 "	2224520	1660	"		275	115	160	
7 00 "	2226070	1550	"		275	115	160	
7 30 "	2227750	1680	"		275	115	160	
8 00 "	2229550	1800	"		275	115	160	
8.30 "	2231200	1650	"		275	115	160	
9 00 "	2232880	1680	"		275	115	160	
9 30 "	2233580	1700	"		275	115	160	
10 00 "	2236260		"		275	115	160	
10 30 "	2237680	1420	"		275	95	180	70290
11 00 "	2239180	1500	"		275	95	180	
11 30 "	2240550	1370	"		275	95	180	
12 00 a.m.	2242150	1000	"		275	95	180	
12 30 "	2243780	1630	"		275	95	180	
1 00 "	2245320	1550	"		275	95	180	
1 30 "	2246855	1525	"		275	95	180	90500
2 00 "	2248635	1780	"		275	95	180	
2 30 "	2250270	1575	"		275	95	180	
3 00 "	2251960	1730	"		275	95	180	
3 30 "	2253785	1825	"		275	95	180	
4 00 "	2255250	1465	"		275	95	180	
4 30 "	2256955	1705	"		275	95	180	
5 00 "	2258475	1520	"		275	95	180	
5 30 "	2260120	1645	"		275	95	180	17250
6 00 "	2261690	1570	"		275	95	180	
6.30 "	2263230	1540	"		275	95	180	
7 00 "	2264900	1670	"		275	95	180	
7 30 "	2266325	1425	"		275	95	180	
8 00 "	2267925	1600	"		275	95	180	
8 30 "	2269420	1495	"		275	95	180	37450

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—February 25 and 26, 1909. Trial Number—29.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
9.00 a.m.	62	$\frac{7}{12}$	4·20	11·23	1600	76·5				
9.30 "	61	$\frac{7}{12}$	3·97	10·86	1750	82·0				
10.00 "	62	$\frac{7}{12}$	4·33	10·97	1890	85·2	10.05 a.m.	50	50	
10.30 "	61	$\frac{7}{12}$	4·14	11·80	1620	84·2				10.40 a.m
11.00 "	61	$\frac{7}{12}$	4·14	13·34	1715	107·2	11.00 "	50	100	
11.30 "	60	$\frac{7}{12}$	4·12	11·21	1845	88·8	11.25 "	50	150	11.40 "
12.00 noon	61	$\frac{5}{12}$	4·20	9·82	1630	87·0				
12.30 p.m.	61	$\frac{1}{3}$	4·57	9·62	1600	96·0	12.30 p.m.	500	200	
1·00 "	62	$\frac{1}{3}$	4·62	9·36	1605	90·5				
1.30 "	62	$\frac{1}{3}$	4·55	9·23	1725	96·0	1.45 "	50	250	1.35 p.m.
2.00 "	62	$\frac{3}{4}$	4·69	15·82	1600	94·0				
2.30 "	63	$\frac{2}{3}$	4·59	16·30	1600	111·4	2.25 "	50	300	
3.00 "	63	$\frac{2}{3}$	4·82	14·42	1645	96·0				
3.30 "	63	$\frac{2}{3}$	4·24	13·61	1735	96·5				
4.00 "	63	$\frac{2}{3}$	4·66	13·59	1745	92·6				
4.30 "	63	$\frac{7}{12}$	4·59	16·52	1615	130·0	4.20 "	75	375	
5.00 "	63	$\frac{1}{2}$	4·93	13·38	1600	107·0				
5.30 "	63	$\frac{1}{2}$	4·53	11·26	1660	88·4				
6.00 "	63	$\frac{1}{2}$	4·63	11·66	1680	93·5	6.05 "	50	425	
6.30 "	63	$\frac{5}{12}$	4·68	11·38	1600	102·0				
7.00 "	65	$\frac{5}{12}$	4·96	12·86	1600	120·0	7.00 "	50	475	
7.30 "	65	$\frac{5}{12}$	5·15	10·53	1800	92·0	7.30 "	50	525	
8.00 "	66	$\frac{5}{12}$	6·23	12·42	1800	106·1				8 00 "
8.30 "	64	$\frac{5}{12}$	4·05	9·97	1970	110·7	8.30 "	50	575	8.30 "
9.00 "	64	$\frac{1}{3}$	4·05	8·61	1920	104·2				
9 30 "	62	$\frac{1}{3}$	3·90	8·48	1850	100·8	9.50 "	50	625	9.50 "
10.00 "	62	$\frac{1}{3}$	4·28	9·43	1920	117·6				
10.30 "	63	$\frac{1}{4}$	4·53	8·85	1650	112·8	10.45 "	50	675	10 30 "
11 00 "	63	$\frac{1}{3}$	4·45	9·85	1640	98·4				10 45 "
11.30 "	63	$\frac{5}{12}$	4·54	12·45	1700	127·6	11.30 "	50	725	
12.00 a.m.	63	$\frac{1}{3}$	4·53	10·71	1600	117·5				
12.30 "	64	$\frac{1}{3}$	5·06	9·73	1880	104·3				
1.00 "	64	$\frac{2}{3}$	5·53	18·26	1775	134·3	1 00 a.m.	25	750	1 00 "
1 30 "	61	$\frac{7}{12}$	4·85	14·20	1760	111·6				
2 00 "	64	$\frac{7}{12}$	4·90	15·08	1775	122·9	1.25 "	50	800	
2.30 "	65	$\frac{1}{2}$	4·06	12·87	1630	102·3				
3 00 "										
3.30 "	65	$\frac{1}{2}$	4·66	13·86	1800	133·1	3.30 "	50	850	3 30 "
4 00 "	65	$\frac{7}{12}$	4·75	12·73	1800	97·5				
4 30 "	65	$\frac{7}{12}$	6·05	14·61	1875	109·1	4.30 "	75	925	
5 00 "	65	$\frac{5}{12}$	4·87	11·91	1620	110·4				
5.30 "	65	$\frac{5}{12}$	4·85	13·06	1635	127·6	5 30 "	75	1000	
6.00 "	65	$\frac{5}{12}$	4·89	11·10	1830	108·0				
6 30 "	65	$\frac{5}{12}$	4·56	10·49	1950	110·0	6.35 "	50	1050	7 00 "
7.00 "	65	$\frac{1}{3}$	4·65	10·87	1700	125·7	7.00 "	50	1100	7 10 "
7.30 "	65	$\frac{1}{3}$	4·60	9·49	1755	102·1	7.45 "	25	1125	
8 00 "	65	$\frac{1}{4}$	4·50	8·27	1605	94·6				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—February 25 and 26, 1909. Trial Number—29.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 30 a.m.	700	64	62	66	3·7	5·0	5·2	7·0	6·0	1·0	60	56
9 00 "	800	66	62	129	3·6	5·0	5·2	7·2	6·7	1·0	70	66
9 30 "	870	65	60	110	4·0	6·5	6·7	9·5	9·0	1·2	63	59
10 00 "	860	64	61	125	3·7	6·5	6·7	7·7	6·6	1·0	68	65
10.30 "	860	64	61	118	3·6	6·5	6·7	8·0	7·2	1·1	63	59
11 00 "	870	64	60	150	3·7	5·7	5·9	8·0	7·5	1·0	60	56
11 30 "	820	63	60	171	3·5	5·0	5·2	8·4	7·6	2·7	74	70
12 00 noon	840	63	62	146	3·6	6·0	6·2	8·6	7·7	1·0	65	61
12.30 p.m.	840	63	63	138	3·8	6·5	6·7	7·6	7·0	1·2	67	63
1 00 "	820	63	64	136	3·6	5·5	5·7	6·6	5·5	0·8	62	59
1 30 "	800	64	64	139	3·6	5·3	5·5	8·6	6·8	1·0	63	60
2 00 "	840	64	64	142	3·6	5·6	5·8	9·0	7·6	2·3	66	64
2 30 "	840	64	64	144	3·6	6·0	6·2	7·8	6·5	1·0	60	56
3 00 "	860	64	65	145	3·5	6·0	6·2	7·2	5·9	0·7	73	69
3 30 "	780	65	64	143	3·5	6·0	6·2	7·2	5·7	0·5	57	54
4 00 "	790	65	64	141	3·5	6·0	6·2	7·3	5·7	0·6	53	50
4 30 "	790	65	64	143	3·6	5·5	5·7	6·5	4·7	0·8	54	57
5 00 "	730	65	64	144	3·4	5·3	5·5	5·9	4·3	0·7	57	53
5 30 "	740	64	64	139	3·5	5·5	5·7	7·2	5·3	0·6	53	50
6 00 "	740	64	65	140	3·4	5·3	5·5	6·3	4·9	0·8	42	39
6 30 "	740	64	67	144	3·3	5·0	5·2	6·1	4·8	1·0	38	35
7 00 "	830	66	70	142	3·5	5·6	5·8	6·9	5·2	0·7	53	50
7 30 "	820	66	71	142	3·7	6·4	6·6	5·7	. .	1·1	37	34
8 00 "	770	66	74	149	3·5	5·6	5·8	6·5	6·0	0·8	52	48
8 30 "	790	70	64	146	3·3	5·0	5·2	5·5	5·0	2·0	60	56
9 00 "	810	68	61	141	3·5	5·4	5·6	7·0	6·3	0·7	50	47
9 30 "	790	66	60	138	3·5	5·2	5·4	7·0	6·2	0·7	57	54
10 00 "	820	63	62	136	3·3	4·8	5·0	6·0	5·7	0·7	60	59
10 30 "	770	63	65	142	3·2	4·6	4·8	5·9	5·2	0·6	51	48
11 00 "	830	63	64	143	3·3	4·8	5·0	7·0	6·2	0·8	60	56
11 30 "	820	63	65	144	3·3	5·0	5·2	7·2	6·8	1·0	53	50
12 00 "	760	63	65	143	3·1	4·5	4·7	5·1	4·7	0·6	40	37
12 30 p.m	850	63	65	145	3·9	7·7	7·9	7·4	6·4	1·0	45	41
1 00 "	790	64	68	144	3·3	5·3	5·5	6·3	5·6	0·8	54	50
1 30 "	840	68	67	143	3·5	6·2	6·4	7·3	6·9	0·9	62	59
2 00 "	860	67	67	141	3·5	6·3	6·5	7·7	7·3	1·0	70	67
2 30 "	820	66	68	145	3·4	6·1	6·3	7·2	6·8	1·0	61	57
3 00 "	840	66	68	143	3·5	6·4	6·6	7·7	7·5	1·0	68	64
3 30 "	860	65	67	140	3·6	6·5	6·7	8·2	7·8	0·9	65	61
4 00 "	830	64	67	149	3·3	5·3	5·5	6·5	6·2	0·9	60	56
4 30 "	880	64	66	140	4·3	8·0	8·2	7·5	7·2	0·8	44	41
5 00 "	820	67	67	142	3·4	5·8	6·0	6·5	6·1	0·6	53	50
5 30 "	840	68	67	143	3·4	6·0	6·2	7·0	6·6	0·9	65	62
6 00 "	800	67	67	141	3·3	5·4	5·6	7·0	6·2	1·1	69	66
6 30 "	840	67	66	142	3·3	5·6	5·8	6·9	6·7	0·8	60	57
7 00 "	870	66	65	142	3·3	5·5	5·7	7·9	7·2	1·6	40	36
7 30 "	810	66	64	139	3·1	5·2	5·4	9·2	8·7	2·2	69	65
8 00	850	66	64	135	3·5	6·4	6·6	9·4	8·9	1·7	70	66
8 30	780	66	65	133	3·2	5·3	5·5	7·1	6·7	1·3	69	66

PRODUCER TRIAL No. 29.

Date—February 25-26, 1909. Producer No. 4, at McGill University.

Time of lighting up—4.30 a.m. Trial commenced 8.30 a.m. February 25; ended 8.30 a.m. February 26.

Duration of trial—24 hours. Kind of fuel—No. 11 coal.

Observers and staff during trial—Killam, Cameron, Gardner.

Computers—Killam, Cameron.

Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1125
2.	Moisture in coal as charged	per cent.	1·3
3.	Calorific value of coal as charged, per lb	B.T.U.	12720
4.	" " of dry coal per lb	B.T.U.	12890
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 53·3; volatile matter, 32·7; ash, 12·7; moisture, 1·3	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 49·8; volatile matter, 5·7 Total	per cent.	55·5
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43·3

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	80170
9.	Average temperature of gas leaving producer	°F.	773
10.	" " " at meter	°F.	65
11.	Average temperature of air in producer house	°F.	65
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	104·5
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	108·2
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	98·3
14.	Average barometric pressure	lbs. sq in.	14·48
15.	" suction at producer	ins. of water	1·0
16.	" suction at exhauster	ins. of water	7·2
17.	" pressure of gas at meter	ins. of water	4·6

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2160
19.	" water used in scrubber and gas washer	lbs.	31610
20.	" tar extracted in scrubber and gas washer	lbs.	119
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		323720
24.	Average explosions per minute		103
25.	Average effective load on brake	lbs.	166·7
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	60·8

28. **Notes.**

Fire poked at: 10.40, 11.40 a.m.; 1.35, 8.00, 8.30, 9.50, 10.30, 10.45 p.m.; 1.00, 3.30, 7.00, 7.4
Refuse removed at: 8.30, 10.45 p.m.; 2.00, 6.15, 7.00, 7.40 a.m.
Behaviour of coal: Works well as regards poking and trouble with clinker.
Average time between poking: 2 hours.
Clinker: No trouble.
Tar: Large amount from wet scrubber
State of engine valves at end of trial: Good condition, did not need cleaning.
Valves last cleaned: Feb. 23, 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·6%
Carbon	70·3%
Nitrogen	0·6%
Oxygen	4·3%
Sulphur	5·8%
Total carbon contained by dry coal charged	780·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

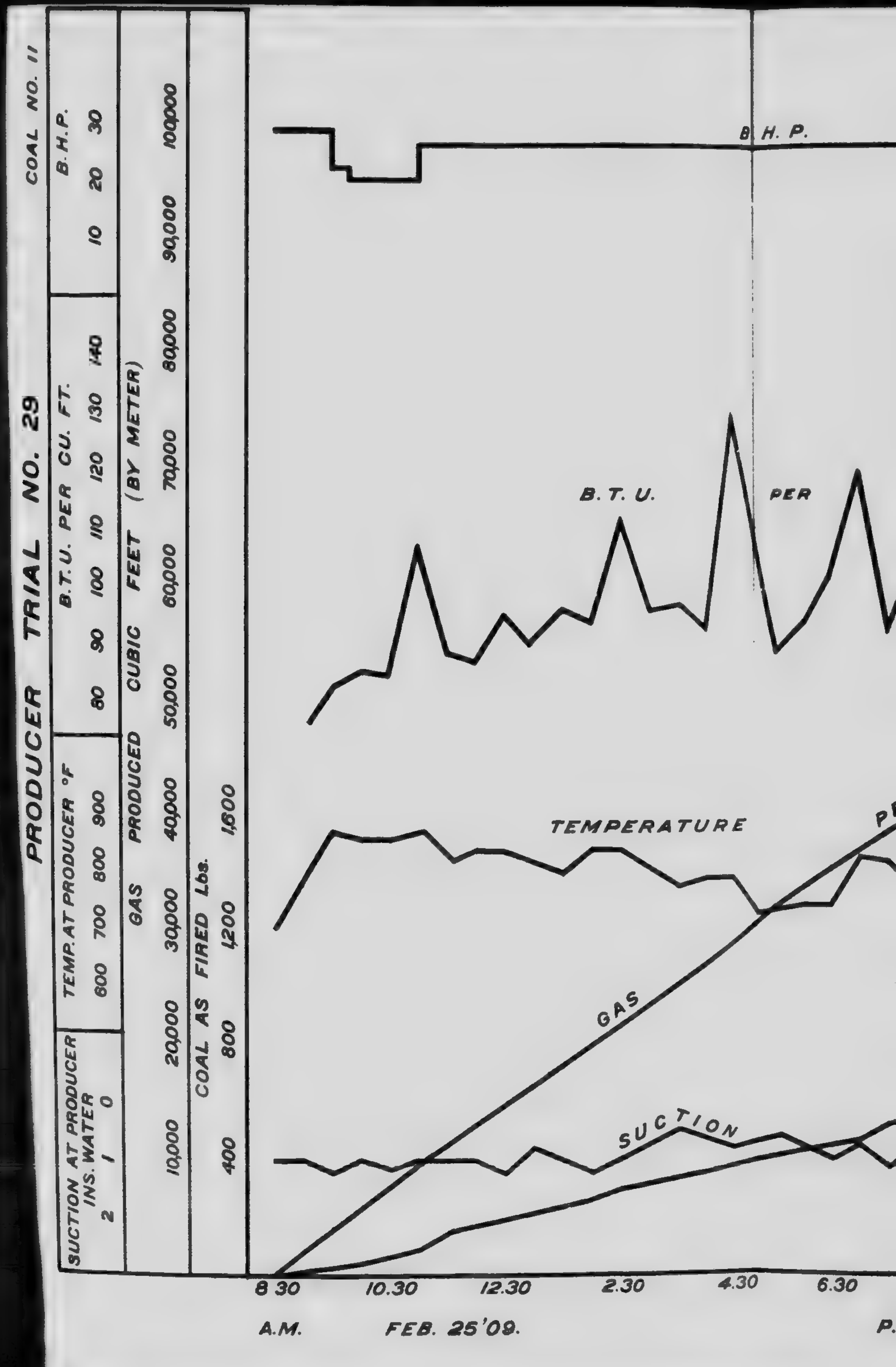
Carbon dioxide	9·2%
Oxygen	0·6%
Carbon monoxide	13·7%
Hydrogen	12·1%
Methane	3·4%
Ethylene	0·2%
Nitrogen	60·8%

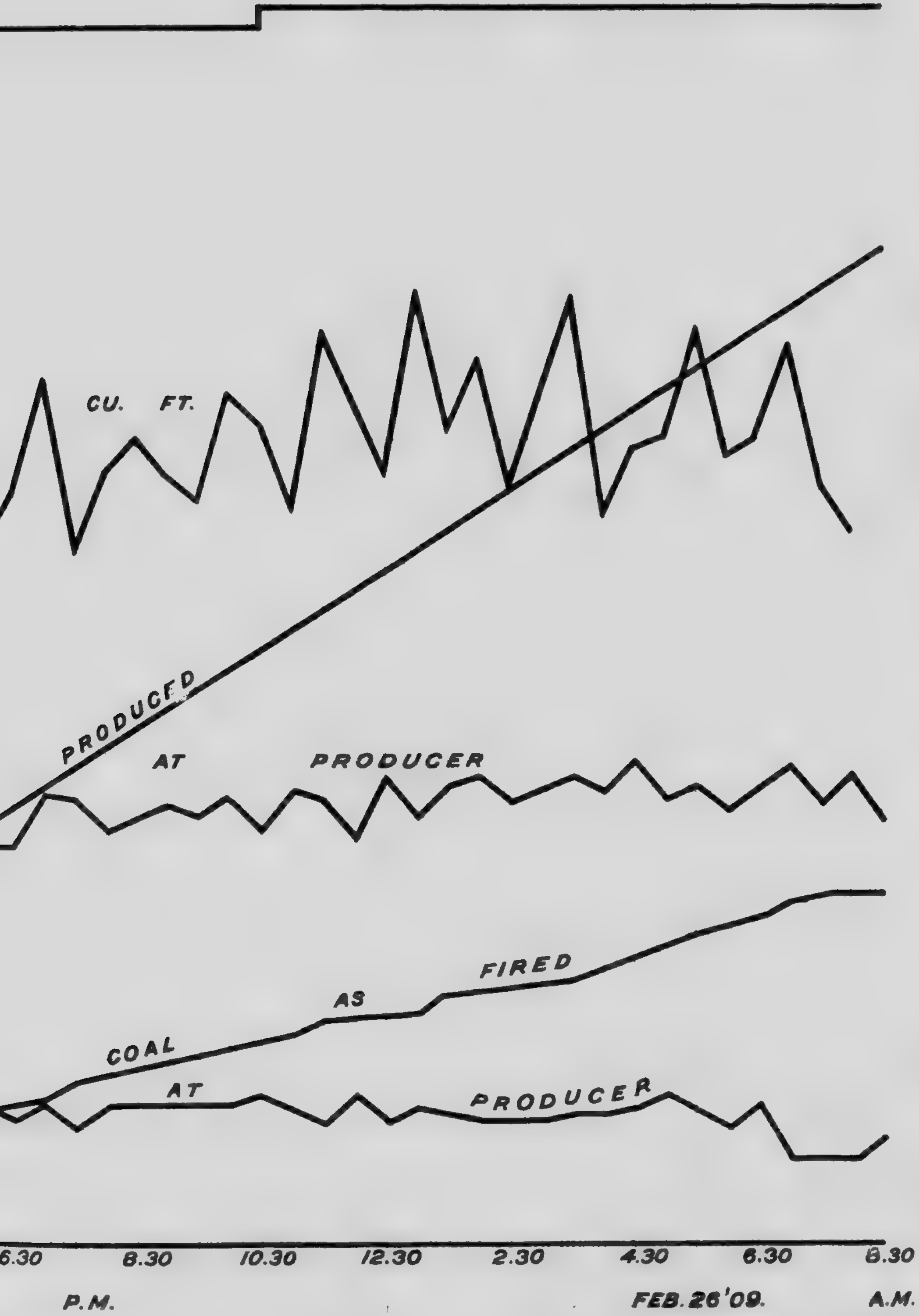
PRODUCER TRIAL NO. 29

COAL NO. 11

PRODUCER TRIAL NO. 29

COAL NO. 11





APPENDIX III VOL. V

REMARKS.

This coal seems to require a deep fire to break up the tar, which appeared in large quantities from the wet scrubber. No trouble in obtaining all the gas required. The calorific value was fair and the engine ran uniformly, carrying a fairly heavy load.

SUMMARY OF RESULTS

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1110
32.	Combustible charged during trial	lbs.	968
33.	Average B.H.P. of engine during trial	H.P.	27·72
34.	“ indicated H.P. of engine during trial	H.P.	35·8
35.	“ H.P. taken by exhauster and gas washer	H.P.	4·0
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	27·72
37.	“ “ “ corresponding to total gas produced	H.P.	27·72
38.	“ “ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	23·72

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	46·8
40.	Dry coal charged per hour	lbs.	46·2
41.	Combustible charged per hour	lbs.	40·4
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	11·7
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	11·5
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	10·1
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	6·76
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·77
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3340
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3225
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3340
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3225
51.	Calorific value of coal charged per hour	B.T.U.	596000
52.	“ “ gas produced per hour (lower value)	B.T.U.	317000
53.	Steam used in producer per hour	lbs.	90

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	69·0
55.	Gas (dry at 60° and 14·7 ibs. per sq. in.) produced dry coal charged	cub. ft.	69·8
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	79·8
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	90·0
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	116·3
59.	Steam used in producer per lb. coal charged	lbs.	1·92
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	28·1
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	394·5
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	53·1
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	45·6
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	36·3
65.	Thermal efficiency of engine, based on B.H.P	per cent.	22·3
66.	Over all efficiency of producer and engine plant	per cent.	11·83
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	11,430
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	21,497

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·69	1·67	1·46
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	1·97	1·95	1·70
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·47	2·44	2·12

SOURIS COAL FIELD.

SASKATCHEWAN.

TRIAL OF No. 4 PRODUCER WITH COAL No. 2040

Date November 16 and 17, 1908. Trial Number 8

OBSERVATIONS OF GENERAL CONDITIONS

General Notes.

Barometer at beginning of trial	29 46 inches
" " 9.00 a.m., Nov. 17	29 58 "
" " 4.30 p.m., " 17	29 52 "
Water meter 5 p.m., Nov. 16	24,539 imperial gallons
" " 4 p.m., " 17	26,529 " "
Difference in 23 hours	1,990 " "
Brick in producer base	780 lbs
Average level of coal surface below top plate of producer	25 inches

TIME.			
11.30	a.m., Nov.	16	Fire lighted. Charged 90 lbs. wood, 80 lbs. coke.
3 30	p.m., "	"	Down-draft with fan exhausting to atmosphere.
4 30	" "	"	Down-draft with exhauster.
4 37	" "	"	Engine started.
			Coal used from time of lighting to start, 904 lb
4 45	" "	"	Trial commenced.
7 00	" "	"	Steam turned on
7 55	" "	"	Steam shut off.
4 45	" "	17	Trial finished.

There was a slight tendency for the coal to clinker and arch. Very little tar was [illegible] used from 7 p.m. to 7.55 p.m on the 16th

Amount of refuse removed, 714 lbs. after drying

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—November 16 and 17, 1908. **Trial Number—8.**

Note: R and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent	per cent.
5.00 p.m. . . .	10·9	0·6	0·1	17·0	5·4	7·1	58·9	29·6
6.00 "	11·2	0·7	0·0	15·9	4·2	9·6	58·4	29·7
7.00 "	11·5	0·8	0·0	15·6	3·4	11·2	57·5	30·2
8 00 " .	11·3	2·2	0·0	14·5	2·7	6·6	62·7	23·8
9 00 " .	11·8	0·8	0·0	14·9	5·1	11·8	57·3	30·1
10.00 " .	11·3	0·9	0·0	15·4	4·7	11·7	57·0	30·8
11.00 "	10·3	0·7	0·0	17·5	5·2	12·0	56·3	32·7
12.00 " .	10·0	0·8	0·0	17·4	4·6	11·7	56·9	32·3
1.00 a.m..	10·1	0·9	0·0	16·9	3·3	12·1	56·8	32·2
2.00 "	11·4	0·8	0·0	14·8	3·6	12·2	57·2	30·6
3.00 " .	10·6	0·8	0·0	16·7	4·0	9·2	58·7	29·9
4.00 "	12·1	0·7	0·0	13·4	4·6	14·3	54·9	32·3
5.00 " . .	11·2	1·0	0·0	15·1	3·3	13·2	56·2	31·6
6.00 " .	12·0	1·1	0·0	14·2	3·6	13·3	55·8	31·1
7.00 " .	11·4	0·9	0·0	14·9	3·5	12·8	56·5	31·2
8.00 " . . .	11·5	0·9	0·0	14·8	3·4	12·3	57·1	30·5
9.00 " .	12·6	1·2	0·1	14·6	4·6	10·2	56·7	29·5
10.00 " .	12·3	0·9	0·0	14·3	4·6	8·0	59·9	26·9
11.00 "	12·4	0·6	0·1	14·4	4·6	10·2	57·7	29·3
12.00 noon.	12·4	0·8	0·0	14·3	2·2	15·4	54·9	31·9
1.00 p.m.	12·5	0·8	0·0	13·8	3·5	9·4	60·0	26·7
2.00 " .	13·1	0·8	0·0	14·2	4·1	16·2	51·6	34·5
3.00 "	13·6	0·7	0·0	12·7	4·2	13·8	55·0	30·7
4.00 " . .	13·6	0·8	0·0	12·7	3·7	12·2	57·0	28·6

OBSERVATIONS OF GAS METER AND B. H. P.

Date—November 16 and 17, 1908. Trial Number—8.

Note: B.O. indicates that there is a surplus amount of gas blowing off to the atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
4.45 p.m.	598140	....	....	325	138	187	45945
5.15 "	600075	1935	B.O.	325	138	187	49215
5.45 "	601955	1880	"	325	138	187	
6.15 "	603695	1740	"	325	138	187	
6.45 "	605440	1745	"	325	138	187	
7.15 "	607160	1720	"	325	138	187	
7.45 "	608625	1465	"	325	138	187	
8.15 "	610090	1465	"	325	138	187	
8.45 "	611525	1435	N.B.O.	325	138	187	
9.15 "	613075	1550	B.O.	325	138	187	
9.45 "	614650	1575	"	325	138	187	
10.15 "	616300	1650	"	325	138	187	
10.45 "	617925	1625	"	325	138	187	
11.15 "	619345	1420	"	325	138	187	
11.45 "	620845	1500	"	325	138	187	
12.15 a.m.	622420	1575	"	325	138	187	
12.45 "	623960	1540	"	325	138	187	
1.15 "	625530	1570	"	325	138	187	
1.45 "	626936	1406	N.B.O.	325	138	187	
2.15 "	628420	1484	B.O.	325	138	187	
2.45 "	629860	1440	N.B.O.	325	138	187	
3.15 "	631300	1440	B.O.	325	138	187	
3.45 "	632760	1460	"	325	138	187	
4.15 "	634285	1525	"	325	136	189	19699
4.45 "	635865	1580	"	325	136	189	
5.15 "	637255	1390	N.B.O.	325	136	189	
5.45 "	638740	1485	B.O.	325	136	189	
6.15 "	640075	1335	N.B.O.	300	121	179	32252
6.45 "	641510	1435	"	300	121	179	
7.15 "	642925	1415	B.O.	300	121	179	
7.45 "	644300	1375	N.B.O.	300	121	179	
8.15 "	645690	1390	"	300	121	179	
8.45 "	647160	1470	"	300	121	179	
9.15 "	648550	1390	"	300	121	179	
9.45 "	649950	1400	"	300	121	179	
10.15 "	651345	1395	"	300	121	179	
10.45 "	652760	1415	"	300	121	179	
11.15 "	654180	1420	"	300	121	179	
11.45 "	655625	1445	"	300	121	179	
12.15 p.m.	657080	1455	"	300	121	179	
12.45 "	658465	1385	"	300	121	179	
1.15 "	659930	1465	"	300	121	179	
1.45 "	661420	1490	B.O.	300	121	179	
2.15 "	662885	1465	"	300	121	179	
2.45 "	664235	1350	N.B.O.	300	121	179	
3.15 "	665655	1420	"	300	121	179	
3.45 "	667010	1355	"	300	121	179	
4.15 "	668340	1330	"	300	121	179	
4.45 "	669735	1395	"	300	121	179	99980

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—November 16 and 17, 1908. Trial Number—8.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
4.45 p.m.	53	7/12	7·50	18·20	1707	103·5	...	...	...	...
5.15 "	53	7/12	6·91	17·97	1680	126·0	5.05 p.m.	77·25	77·25	...
5.45 "	55	7/12	7·34	18·17	1680	123·5	...	...	...	...
6.15 "	57	7/12	7·62	18·50	1710	126·0	6.05 "	50·0	127·25	...
6.45 "	57	7/12	7·79	18·76	1678	125·0	6.45 "	50·0	177·25	...
7.15 "	58	7/12	8·00	19·03	1666	125·0	...	...	...	...
7.45 "	59	7/12	8·29	18·44	1678	115·7	7.35 "	75·75	253·00	...
8.15 "	60	7/12	8·14	18·53	1666	117·5	...	...	...	...
8.45 "	60	7/12	8·19	19·17	1650	123·0	8·35 "	47	300	...
9.15 "	60	2/3	8·32	18·61	1900	116·5	9.15 "	50	350	9.25 p.m.
9.45 "	60	2/3	8·30	18·69	1915	118·3	9.45 "	25	375	...
10.15 "	62	7/12	8·42	18·62	1682	116·3	10.05 "	50	425	...
10.45 "	62	7/12	8·40	18·60	1600	111·0	10.45 "	25	450	...
11.15 "	62	7/12	8·30	19·07	1615	118·0	11.30 "	50	500	...
11.45 "	63	7/12	8·87	19·15	1648	120·0	...	...	...	...
12.15 a.m.	63	7/12	8·91	19·59	1600	116·0	12·05 a.m.	50	550	...
12.45 "	64	7/12	8·15	18·76	1628	117·8	1.00 "	50	600	...
1.15 "	65	7/12	8·61	19·68	1635	123·0	1.15 "	25	625	...
1.45 "	65	7/12	8·60	19·90	1600	122·3	1.45 "	25	650	...
2.15 "	66	7/12	8·42	19·18	1600	117·0	2.00 "	25	675	...
2.45 "	66	2/3	8·57	20·42	1680	118·5	2.35 "	25	700	...
3.15 "	66	2/3	8·54	20·08	1680	115·3	2.45 "	25	725	...
3.45 "	66	2/3	8·40	14·53	1600	123·0	3.15 "	50	775	
4.15 "	67	7/12	8·45	19·52	1610	120·8	3.50 "	50	825	
4.45 "	67	2/3	8·39	20·20	1685	118·0	4.30 "	50	875	
5.15 "	67	2/3	8·38	20·05	1665	116·0	5.15 "	50	925	5.15 a.m.
5.45 "	66	2/3	8·32	20·18	1675	118·1	5.45 "	50	975	
6.15 "	66	2/3	8·33	20·50	1690	122·3	6.15 "	50	1025	6.05 "
6.45 "	66	2/3	8·40	20·35	1710	122·0	...	...	...	
7.15 "	66	2/3	8·38	19·59	1718	114·5	7.15 "	50	1075	
7.45 "	66	3/4	8·46	19·59	1960	115·2	...	...	...	
8.15 "	66	7/12	8·49	19·19	1595	115·8	8.30 "	50	1125	
8.45 "	66	7/12	8·45	19·34	1595	118·0	8.45 "	50	1175	
9.15 "	66	2/3	8·42	19·42	1800	117·7	9.30 "	50	1225	
9.45 "	66	7/12	8·33	19·62	1660	127·0	9.45 "	50	1275	
10.15 "	66	2/3	8·41	19·43	1765	115·6	10.15 "	50	1325	
10.45 "	67	2/3	8·35	19·75	1735	117·5	10.45 "	50	1375	
11.15 "	67	2/3	8·40	20·40	1640	113·6	...	...	...	11.25 "
11.45 "	67	2/3	8·41	19·79	1700	115·0	11.45 "	50	1425	
12.15 p.m.	67	7/12	8·36	19·37	1600	119·3	12.30 p.m.	50	1475	
12.45 "	67	7/12	8·60	18·66	1685	115·0	...	...	...	
1.15 "	67	7/12	8·85	18·90	1729	118·0	...	...	...	
1.45 "	67	7/12	8·85	18·68	1715	114·6	...	...	...	
2.15 "	67	7/12	8·63	18·92	1683	117·5	2.05 "	50	1525	
2.45 "	67	7/12	8·38	18·74	1700	119·5	2.45 "	50	1575	
3.15 "	67	7/12	8·29	18·29	1706	116·0	...	...	...	
3.45 "	67	1/6	8·20	18·20	474	113·0	3.45 "	50	1625	
4.15 "	67	7/12	8·25	18·16	1700	115·0	...	...	...	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—November 16 and 17, 1908. Trial Number—8

Time.	TEMPERATURES. °F.				PRESSURE. Ins. of Water.			SUCTION. Ins. of Water.			STEAM PRESSURE. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet.	Producer Outlet.	Inlet.	Outlet.
4.45 p.m.	520	56	58	135	3·6	5·8	6·0	8·3	4·7	2·1	0	0
5.15 “	550	58	60	142	3·6	6·0	6·2	9·0	5·0	2·4	0	0
5.45 “	540	58	60	132	3·5	5·3	5·5	8·2	4·6	2·2	0	0
6.15 “	540	60	61	132	3·5	5·5	5·5	8·2	4·7	2·2	0	0
6.45 “	540	61	61	128	3·4	5·3	5·5	8·6	5·0	2·4	0	0
7.15 “	530	62	62	130	3·3	4·8	5·0	8·1	4·9	2·6	46	45
7.45 “	520	63	62	129	3·3	4·9	5·1	8·1	5·1	2·8	63	62
8.15 “	510	64	62	122	3·2	4·5	4·7	8·1	5·2	2·9	0	0
8.45 “	500	64	62	132	3·2	4·5	4·7	8·1	5·1	2·8	0	0
9.15 “	520	65	62	132	3·3	4·6	4·8	8·1	5·2	2·6	0	0
9.45 “	520	65	64	130	3·4	5·0	5·2	9·1	5·7	3·2	0	0
10.15 “	530	66	63	128	3·4	5·0	5·2	8·8	5·6	3·2	0	0
10.45 “	520	66	64	127	3·3	4·6	4·8	8·2	5·3	2·9	0	0
11.15 “	500	66	64	126	3·2	4·3	4·5	7·2	4·4	2·8	0	0
11.45 “	520	66	66	127	3·3	5·0	5·2	8·5	5·2	3·4	0	0
12.15 a.m.	520	66	66	126	3·3	4·9	5·1	8·7	5·6	3·6	0	0
12.45 “	520	66	66	122	3·3	4·8	5·0	8·8	5·7	3·4	0	0
1.15 “	520	66	68	129	3·3	4·8	5·0	8·6	5·4	3·3	0	0
1.45 “	510	67	67	130	3·3	4·9	5·0	7·8	5·1	3·0	0	0
2.15 “	520	67	67	129	3·3	4·8	5·0	8·0	5·3	3·0	0	0
2.45 “	520	67	68	127	3·3	4·8	5·1	8·0	5·2	3·9	0	0
3.15 “	520	67	67	128	3·3	4·8	5·0	8·2	5·3	3·1	0	0
3.45 “	520	67	68	126	3·3	4·8	5·0	8·5	5·4	3·2	0	0
4.15 “	540	65	68	132	3·3	4·9	5·1	9·3	6·1	3·8	0	0
4.45 “	540	66	67	132	3·3	4·6	4·8	8·3	5·5	3·4	0	0
5.15 “	540	66	67	130	3·2	4·5	4·7	9·2	6·2	4·0	0	0
5.45 “	530	66	66	130	3·2	4·5	4·7	9·0	5·3	3·2	0	0
6.15 “	530	66	66	129	3·1	4·1	4·3	8·5	6·0	3·8	0	0
6.45 “	540	66	67	130	3·2	4·7	4·9	8·8	6·0	3·8	0	0
7.15 “	530	66	67	130	3·1	4·3	4·5	8·3	5·5	3·5	0	0
7.45 “	530	66	66	130	3·1	4·3	4·5	8·3	5·5	3·6	0	0
8.15 “	530	66	67	130	3·1	4·4	4·6	8·6	5·8	3·6	0	0
8.45 “	550	66	67	129	3·2	4·6	4·8	9·3	6·2	4·0	0	0
9.15 “	540	66	67	129	3·1	4·2	4·4	9·3	5·8	3·6	0	0
9.45 “	540	66	67	128	3·2	4·5	4·7	8·9	6·0	3·9	0	0
10.15 “	530	66	68	130	3·0	4·2	4·4	8·1	5·4	3·2	0	0
10.45 “	530	66	68	131	3·1	4·3	4·5	8·3	5·5	3·3	0	0
11.15 “	530	66	68	130	3·1	4·4	4·6	8·4	5·6	3·5	0	0
11.45 “	540	66	64	131	3·1	4·5	4·7	8·7	6·0	3·8	0	0
12.15 “	540	66	68	132	3·2	4·5	4·7	8·9	6·0	3·9	0	0
12.45 “	540	65	67	132	3·1	4·3	4·5	8·4	5·7	3·6	0	0
1.15 p.m.	550	66	69	135	3·2	4·6	4·8	8·7	5·9	3·6	0	0
1.45 “	550	66	68	136	3·2	4·6	4·8	8·9	6·0	3·8	0	0
2.15 “	550	66	68	134	3·2	4·6	4·8	8·9	6·0	4·0	0	0
2.45 “	530	66	68	134	3·0	4·1	4·3	9·0	6·4	4·4	0	0
3.15 “	540	66	68	135	3·1	4·3	4·5	8·5	5·8	3·6	0	0
3.45 “	520	66	68	132	3·0	4·1	4·3	8·2	5·7	3·7	0	0
4.15 “	520	66	67	132	3·0	4·1	4·3	8·2	5·6	3·6	0	0
4.45 “	530	66	67	133	3·1	4·3	4·5	8·4	5·7	3·6	0	0

PRODUCER TRIAL No. 8.

Date—November 16-17, 1909. Producer No. 4, at McGill University.
Time of lighting up—11.30 a.m. Trial commenced 4.45 p.m. November 16; ended 4.45 p.m. November 17.
Duration of trial—24 hours. Kind of fuel—No. 2040 coal.
Observers and staff during trial—Killam, Cameron, Gardner.
Computers—Cameron, Killam.
Chemists—Campbell, Nicolls, Stansfield.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1625
2.	Moisture in coal as charged	per cent.	23·3
3.	Calorific value of coal as charged, per lb	B.T.U.	8300
4.	" " of dry coal per lb	B.T.U.	10820
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 36·7; volatile matter, 32·8; ash, 7·2; moisture, 23·3	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, ——; volatile matter, ——	per cent.	..
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	35

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	71595
9.	Average temperature of gas leaving producer	°F.	529
10.	" " " at meter	°F.	65
11.	Average temperature of air in producer house	°F.	66
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	118
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. sq. in.)	B.T.U.	122·4
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	112·7
14.	Average barometric pressure	lbs. sq in.	14·48
15.	" suction at producer	ins. of water	3·3
16.	" suction at exhauster	ins. of water	8·45
17.	" pressure of gas at meter	ins. of water	3·95

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	45
19.	" water used in scrubber and gas washer	lbs.	265330
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·0

ENGINE.

23.	Total revolutions during trial (from counter)		308070
24.	Average explosions per minute		103
25.	Average effective load on brake	lbs.	182·6
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	65·23

28. **Notes.**

Fire poked at: 9.25 p.m.; 2.0, 5.15, 6.05, 11.25 a.m
Behaviour of coal: Very good
Average time between poking: 4 hours, 48 minutes
Clinker: Slight tendency to clinker
Tar: No tar
State of engine valves at end of trial: Clean
Valves last cleaned: Previous to trial

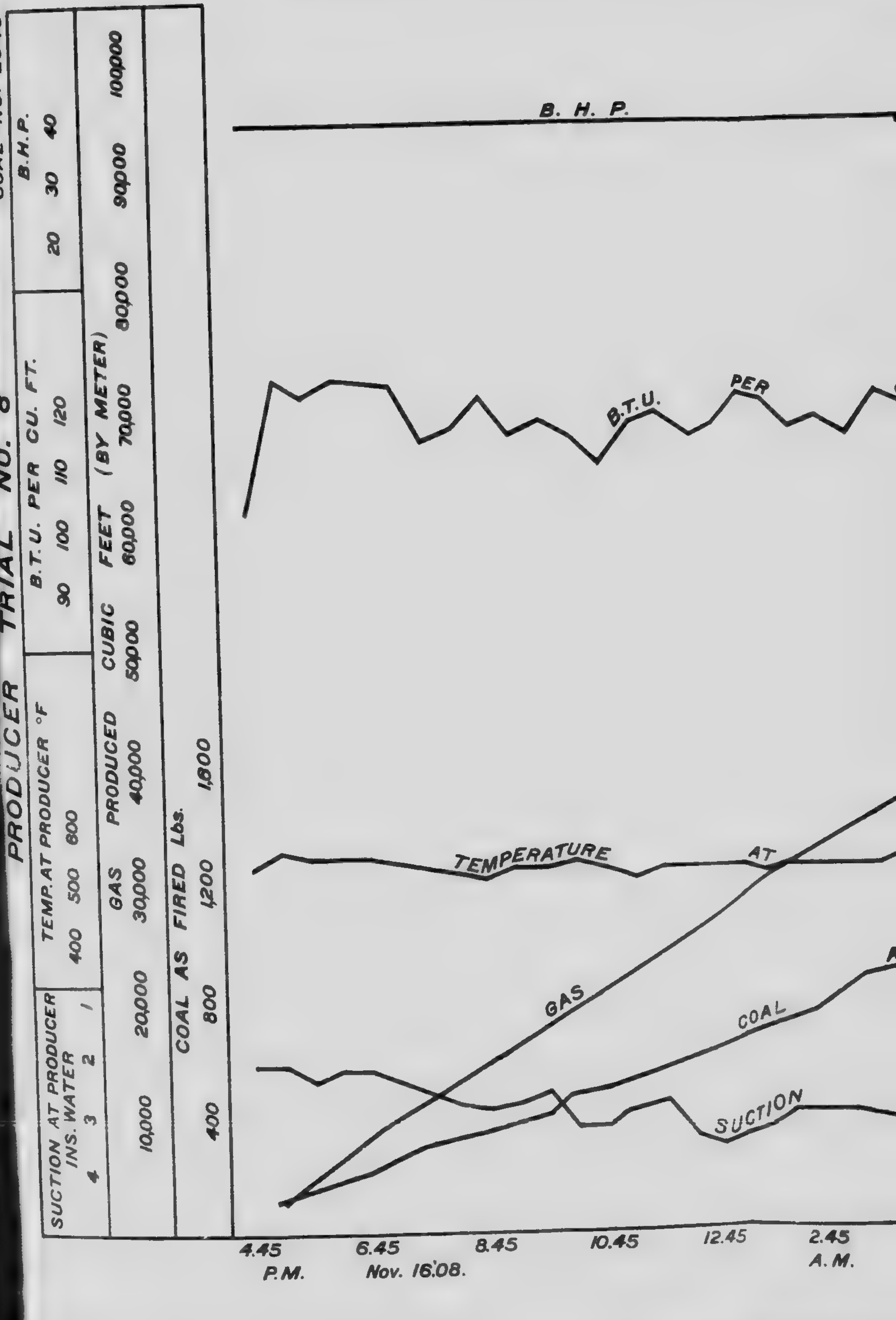
29. ANALYSIS OF DRY COAL.

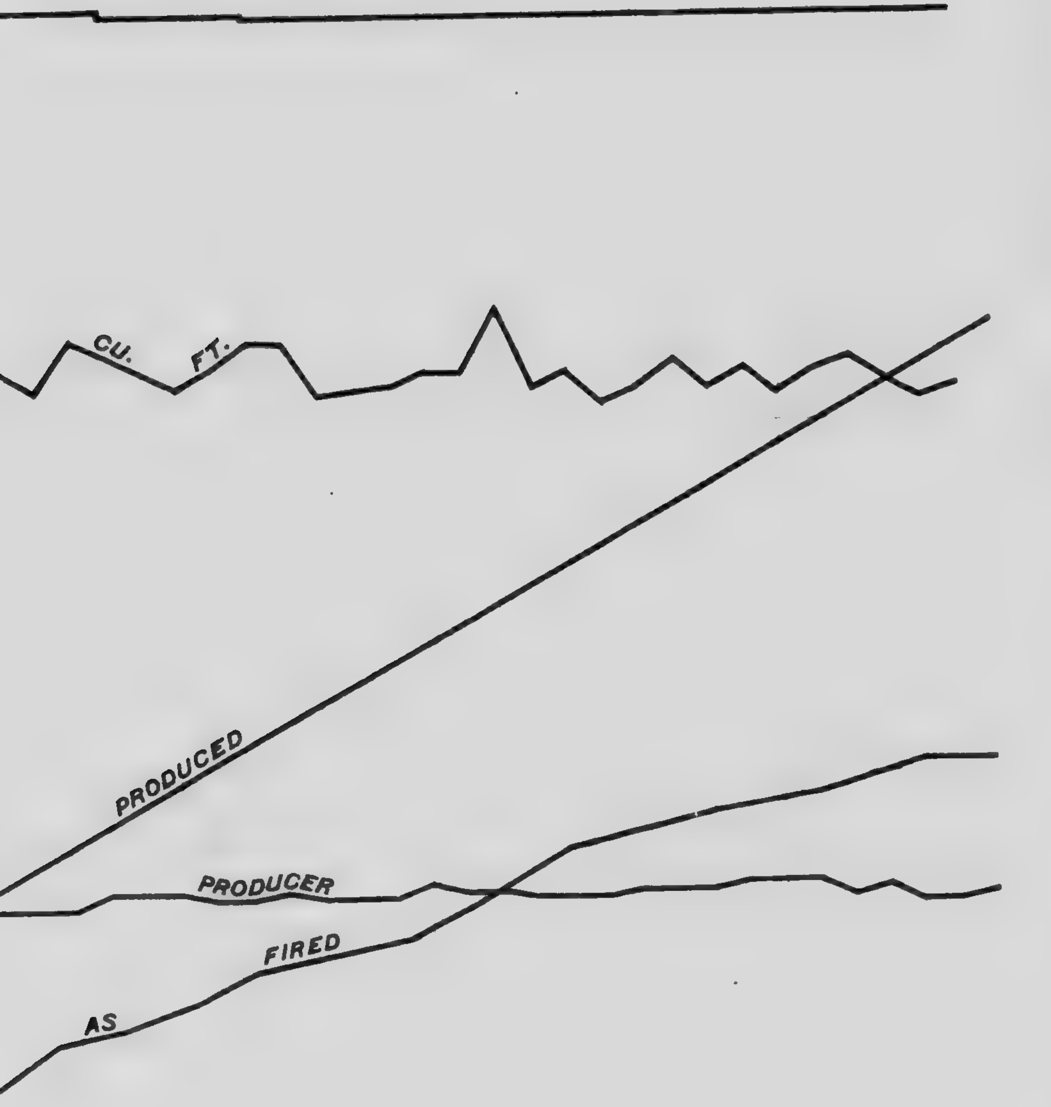
Hydrogen	4·5%
Carbon	64·7%
Nitrogen	1·1%
Oxygen	19·6%
Sulphur	0·7%
Total carbon contained by dry coal charged	807·0 lbs.

30. ANALYSIS OF GAS BY VOLUME

Carbon dioxide	11·78%
Oxygen	0·90%
Carbon monoxide	15·05%
Hydrogen	11·40%
Methane	4·00%
Ethylene	0·00%
Nitrogen	57·00%

PRODUCER TRIAL NO. 8 COAL NO. 2040


COAL NO. 2040
PRODUCER TRIAL NO. 8
B.H.P.
20 30 40
B.T.U. PER CU. FT.
90 100 110 120
TEMP. AT PRODUCER °F
400 500 600
SUCTION AT PRODUCER INS. WATER
4 3 2 1
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600
B. H. P.
B.T.U. PER
TEMPERATURE AT
GAS
COAL
SUCTION
4.45 P.M.
6.45 Nov. 16.'08.
8.45
10.45
12.45
2.45 A.M.



APPENDIX III VOL.V

REMARKS.

For producer work this coal is very good, requiring practically no steam. The calorific value of the gas was high and very little poking was required. The gas was nearly uniform throughout the whole trial There was a slight tendency for the fire to arch. No trouble was experienced from tar.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	1247
33.	Average B.H.P. of engine during trial	lbs.	1130
34.	" indicated H.P. of engine during trial	H.P.	28·7
35.	" H.P. taken by exhauster and gas washer	H.P.	38·5
36.	" B.H.P. while gas consumption of engine was taken	H.P.	3·5
37.	" " corresponding to total gas produced	H.P.	28·1
38	" " " " " " and	H.P.	29·7
	available for outside use, allowing for power used	H.P.	26·2

HOURLY QUANTITIES.

39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	67·7
41.	Combustible charged per hour	lbs.	52·0
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	47·1
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	16·9
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	13·0
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	11·75
46	Coal (as charged) per hour equivalent to steam used in producer	lbs.	7·98
47.	Gas (by meter) supplied by producer per hour	lbs.	0·38
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	2980
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	2875
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	2822
51.	Calorific value of coal charged per hour	cub. ft.	2725
52.	" " gas produced per hour (lower value)	B.T.U.	563000
53.	Steam used in producer per hour	B.T.U.	324000
		lbs.	1·9

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	42·5
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	55·3
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	61·0
58.	" " " " " " B.H.P. "	cub. ft.	70·8
59.	Steam used in producer per lb. coal charged	cub. ft.	97·0
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	·0277
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	16
62.	Efficiency of process of gas production and cleaning, based on coal charged	lbs.	[illegible]
63	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	57·8
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	51·1
65.	Thermal efficiency of engine, based on B.H.P	per cent.	48·6
66.	Over all efficiency of producer and engine plant	per cent.	23·3
67.	Calorific value of gas supplied to engine per B.H.P. per hour	per cent.	13·45
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	10,900
		B.T.U.	18,924

		Coal as charged.	Dry coal.	Combustible.
69	Pounds per hour charged into producer per B.H.P. developed by engine	2·28	1·75	1·59
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·58	1·98	1·80
71	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·71	2·09	1·89

TRIAL OF No. 4 PRODUCER WITH COAL No. 2040.

Date—January 4 and 5, 1909 Trial Number—17.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	20·84 inches
" " 8.40 p.m.	29·80 "
" " end of trial	29·63 "
Water meter 9 00 a.m., Jan. 4	48,181 imperial gallons
" " 3.30 a.m., " 5	49,799 " "
Difference, in 18½ hours	1,618 " "
Brick in producer base	1,300 lbs.
Average of level of coal below top plate of producer	26 inches

TIME			
3.00 a.m.,	Jan.	4	Fire started with 8 lbs. of shavings, 30 lbs. wood, 153 lbs. coke, and 244 lbs. of coal.
4 00 "	"		Charged 240 lbs. of coal.
5.00 "	"		" 233 "
6.00 "	"	"	Down-draft with fan exhausting to the atmosphere.
8.00 "	"	"	Charged 75 lbs. of coal.
8 20 "	"	"	Down-draft with exhauster.
8 30 "	"	"	Started engine.
8.40 "	"	"	Trial commenced.
8.50 "	"	"	Engine shut down in order to clear an accumulation of water [illegible] the exhaust pipe. Gas blown to atmosphere.
10 00 "	"	"	Engine started
10.30 p.m.,	"	"	Engine running light due to a hot bearing. Gas allowed to [illegible] to the atmosphere.
3 40 a.m.,	"	5	Trial finished.

No load was carried by the engine after 10 30 owing to a hot bearing but the producer was at the regular rate

During the last 2 hours, excessive suction was caused by the baffle brick at the producer outlet broken, and partly blocking up gas outlet

Neither gas washer nor sawdust scrubber was used. No steam was used.

87 lbs. of dry refuse removed from the producer during the trial

817 lbs of dry refuse removed from the producer after the trial

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 4 and 5, 1909.

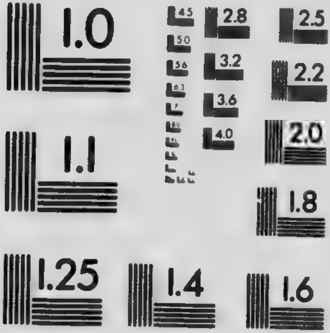
Trial Number—17.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
11 00 a.m.	11·5	1·3	0·0	9·3	4·[illegible]	10·8	62·2	28·0
1.00 p.m....	11·5	1·0	0·1	11·5	1·1	12·1	59·7	27·8
2.00 "	10·7	0·8	0·0	12·8	3·7	14·8	57·2	31·3
3.00 "	12·6	0·4	0·2	10·2	3·7	13·7	59·2	27·8
4 00 "	11·4	0·7	0·4	9·9	4·6	14·3	58·7	29·2
6 00 "	10·0	0·6	0·2	17·8	4·1	11·0	56·3	33·1
7 00 "	10·4	0·6	0·3	17·4	3·0	13·7	54·6	34·4
8 00 "	12·2	0·7	0·2	14·5	3·5	15·0	53·9	33·2
9.00 "	13·2	1·1	0·1	13·0	4·4	14·9	53·3	32·4
10.00 "	11·6	1·5	0·0	15·4	2·6	16·3	52·6	34·3
11.00 "	11·2	1·6	0·0	15·4	2·7	17·6	51·5	35·7
12.00 "	13·4	1·4	0·1	11·5	3·6	15·3	54·7	30·5
2 00 a.m.....	11·3	1·3	0·1	14·7	2·8	12·1	58·2	29·2

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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Rochester, New York 14609 USA
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OBSERVATIONS OF GAS METER AND B. H. P.

Date—January 4 and 5, 1909. Trial Number—17

Notes: Engine started 9.55 a.m. (for second time). B.O. indicates that there is a surplus supply of gas blowing off into atmosphere. N.B.O. indicates that all the gas is passing to gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.40 a.m. ..	1276460	....	N.B.O.	....	....	....	07300
9.10 " ..	1278180	1720	"	Load dropped, engine stopped.			
10.10 " ..	1281180	3000	"	325	120	205	09390
10.40 " ..	1282730	1550	"	325	120	205	....
11.10 " ..	1284290	1560	"	325	120	205	....
11.40 " ..	1285850	1560	"	325	120	205	....
12.10 p.m. ..	1287420	1570	"	325	120	205	....
12.40 " ..	1289020	1600	"	325	120	205	....
1.10 " ..	1290640	1620	"	325	120	205	....
1.40 " ..	1292220	1580	"	325	120	205	....
2.10 " ..	1293720	1500	"	325	125	200	36730
2.40 " ..	1295390	1670	"	325	125	200	....
3.10 " ..	1297030	1640	"	....	....	....	....
3.40 " ..	1298580	1550	"	325	132	193	....
4.10 " ..	1300205	1625	"	325	132	193	....
4.40 " ..	1301705	1500	"	325	132	193	....
5.40 " ..	1305060	3365	"	325	132	193	....
6.10 " ..	1306630	1570	"	325	132	193	....
6.40 " ..	1308220	1590	"	325	132	193	....
7.10 " ..	1309870	1650	"	325	132	193	....
7.40 " ..	1311480	1610	"	325	132	193	....
8.10 " ..	1313080	1600	"	325	132	193	....
8.40 " ..	1314670	1590	"	325	132	193	....
9.10 " ..	1316220	1550	"	Engine stopped at 8.50 a.m.			and
9.40 " ..	1317820	1600	"	was restarted at 10 a.m.			
10.10 " ..	1319350	1570	"	325	135	190	90250
10.40 " ..	....	....	....	Load removed at 10.30 a.m.			
11.10 " ..	1322430	3080	"	....	....	....	....
11.40 " ..	1324060	1630	"	No load during rest of trial.			
12.10 a.m. ..	1325450	1390	"	....	....	....	....
12.40 " ..	1326990	1540	"	....	....	....	....
1.10 " ..	1328490	1500	"	....	....	....	....
1.40 " ..	1330980	1590	"	....	....	....	....
2.10 " ..	1331440	460	"	....	....	....	....
2.40 "	1332860	1420	"	....	....	....	....
3.10 " ..	1334280	1420	"	....	....	....	....
3.40 " ..	1335660	1380	"	....	....	....	....

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—January 4 and 5, 1909.

Trial Number.—17

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
8.40 a.m.	59	10/12	16·90	31·39	1660	114·5		lbs.	lbs.	
9.10 “	59	2/3	11·77	26·44	1660	144·7	9.00 a.m.	25	25	
9 40 “	59	3/4	9·89	24·54	1620	125·3	9.30 “	25	50	
10.10 “	60	3/4	9·73	24·84	1600	128·0	10.00 “	50	100	
10 40 “	62	7/12	9·41	21·22	1670	134·0	10.25 “	50	150	10.15 a.m.
11.10 “	63	1/2	9·74	19·56	1680	130·7	11.00 “	50	200	
11.40 “	64	1/2	9·94	19·95	1635	129·5	11.45 “	50	250	
12.10 p.m.	65	1/2	10·10	19·70	1650	125·5	12.00 p.m.	25	275	
12.40 “	65	1/2	10·01	19·83	1650	128·3	12.50 “	50	325	
1.10 “	66	1/2	10·19	20·92	1740	124·0	1.25 “	50	375	
1.40 “	67	7/12	10·90	20·99	1750	120·0				
2.10 “	67	7/12	11·15	21·37	1750	121·5	2.10 “	50	425	
2 40 “	67	7/12	11·22	21·58	1760	123·7	2.35 “	50	475	
3 10 “	68	7/12	11·32	21·94	1755	126·5	3.15 “	50	525	
3.40 “	68	7/12	11·48	21·71	1780	123·7	3.50 “	75	600	
4 10 “	68	7/12	11·40	21·43	1790	121·8				
4 40 “	68	7/12	11·55	21·67	1780	122·4	4.45 “	50	650	
5.10 “	68	7/12	11·72	21·79	1795	122·5				
5 40 “	69	7/12	12·41	23·58	1600	121·5	5.30 “	50	700	
6.10 “	69	7/12	13·05	23·72	1600	116·0				
6 40 “	70	2/3	13·37	24·75	1800	121·7				
7.10 “	68	7/12	9·56	19·92	1780	125·2	7.00 “	100	800	
7 40 “	66	1/2	9·18	18·23	1770	129·9	7.35 “	50	850	
8 10 “	67	7/12	9·93	19·71	1780	118·3	7.55 “	50	900	
8.40 “	68	7/12	10·54	20·78	1790	124·7	8.20 “	50	950	
9 10 “	68	7/12	11·84	21·89	1805	123·4	9.00 “	50	1000	
9.40 “	68	7/12	12·08	21·90	1805	120·5				
10.10 “	69	7/12	12·94	24·23	1600	122·7	10·00 “	50	1050	9.45 p.m.
10 40 “	69	1/2	9·83	20·63	1650	141·3	10.30 “	50	1100	10.25 “
11.10 “	68	2/3	9·15	20·58	1800	122·4	11.10 “	25	1125	11.15 “
11.40 “	68	2/3	9·61	21·24	1760	121·7	11.20 “	75	1200	
12.10 a.m.	68	7/12	8·13	19·92	1665	133·3	12.00 a.m.	75	1275	
12.40 “	68	3/4	8·02	20·83	1675	113·2	12.45 “	50	1325	
1.40 “	67	1/2	8·90	16·64	2200	135·1				
2.10 “	67	1/2	9·35	17·33	1880	119·0	2.05 “	150	1475	
2.40 “	67	1/2	9·82	17·22	1915	112·4				
3 40 “	67	1/2	10·66	18·14	1835	108·6				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—January 4 and 5, 1909. Trial Number—17.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.40 a.m.	460	60	56	82	3·5	5·0	5·2	4·7	Gas washer not used.	1·0	......	No steam used.
9.10 "	500	60	58	......	......	......	......	4·0		1·0	......	
10.10 "	510	61	65	85	3·3	4·7	4·9	4·7		1·0	......	
10.40 "	510	62	68	132	3·5	5·0	5·2	5·3		1·5	......	
11.10 "	500	64	69	139	4·0	5·0	5·2	5·0		1·4	......	
11.40 "	500	65	69	132	3·3	4·7	4·9	5·4		1·5	......	
12.10 p.m.	520	66	70	132	3·2	5·0	5·2	5·7		1·6	......	
12.40 "	530	66	69	129	3·4	5·0	5·2	5·7		1·7	......	
1.10 "	540	66	70	132	3·7	5·0	5·2	6·1		2·1	......	
1.40 "	520	66	70	133	3.5	4.5	4.7	5·7		1·9	......	
2.10 "	520	66	70	136	3·3	4·5	4·7	5·4		1·7	......	
2.40 "	550	67	70	134	3·3	5·0	5·2	6·0		2·1	......	
3.10 "	510	67	71	137	3·0	4·0	4·3	4·4		0·9	......	
3.40 "	540	67	72	136	3·4	5·1	5·3	5·8		1·7	......	
4.10 "	540	67	70	137	3·3	4·5	4·7	5·4		1·6	......	
4.40 "	520	67	70	137	3·1	4·3	4·5	4·4		2·0	......	
5.40 "	550	67	72	134	3·5	5·3	5·5	6·2		2·0	......	
6 10 "	540	68	72	134	3·3	4·9	5·1	5·8		1·8	......	
6.40 "	540	68	72	136	3·3	4·8	5·0	6·1		2·1	......	
7.10 "	540	68	68	137	3·3	4·8	5·0	6·2		2·2	......	
7.40 "	580	66	70	138	3·3	4·8	5·0	6·0		2·0	......	
8 10 "	560	66	67	141	3·3	4·8	5·0	6·0		2·0	......	
8.40 "	570	66	69	141	3.2	4·8	5·0	6·2		2·1	......	
9.10 "	560	68	70	140	3·3	4·8	5·0	7·5		3·4	......	
9.40 "	540	68	72	122	3·3	4·7	4·9	7·6		3·6	......	
10.10 "	540	68	72	129	3·2	4·6	4·8	8·0		3·8	......	
11.10 "	530	67	68	......	3·0	4·0	4·2	7·5		4·5	......	
11.40 "	540	67	68	......	3·0	4·0	4·2	8·8		4·6	......	
12.40 a.m	560	66	67	......	3.0	4·0	4·2	8·8		4·6	......	
1.10 "	560	66	67	......	2·9	4·0	4·2	8·9		4·7	......	
1.40 "	570	66	68	......	2·7	4·0	4·2	9·0		5·0	......	
2.10	560	66	68	......	2·6	4·0	4·3	9·5		5·6	......	
2.40 "	560	66	68	......	2·4	4·0	4·4	9·4		5·4	......	

PRODUCER TRIAL No. 17.

Date—January 4-5, 1909. Producer No. 4, at McGill University.

Time of lighting up—3 a.m. Trial commenced 8.40 a.m., January 4; ended 3.40 a.m., January 5.

Duration of trial—19 hours. Kind of fuel—No. 2040 coal.

Observers and staff during trial—Killam, Gardner, Cameron.

Computers—Killam, Cameron,

Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1475
2.	Moisture in coal as charged	per cent.	13·4
3.	Calorific value of coal as charged, per lb	B.T.U.	9370
4.	" " of dry coal per lb	B.T.U.	10820
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 32·2; volatile matter, 43·3; ash, 11·1; moisture, 13·4	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 38·0; volatile matter, 9·8 Total	per cent.	47·8
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	34

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	59200
9.	Average temperature of gas leaving producer	°F.	529
10.	" " " at meter	°F.	65
11.	Average temperature of air in producer house	°F.	66
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	124·2
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	128·3
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	117·4
14.	Average barometric pressure	lbs. sq in.	14·6
15.	" suction at producer	ins. of water	1·7
16.	" suction at exhauster	ins. of water	5·5
17.	" pressure of gas at meter	ins. of water	4·1

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	0
19.	" water used in scrubber and gas washer	lbs.	16460
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	

ENGINE.

23.	Total revolutions during trial (from counter)		161720
24.	Average explosions per minute		105·5
25.	Average effective load on brake	lbs.	197·8
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	73·1

28.

Notes.

Fire poked at: 10.15 a.m.; 9.45, 10.25, .m.
Refuse removed at: 10.35 a.m.; 12.05, -- ,, 2.10, 5.05, 8.55, 10.25, 11.15, 12.00 p.m.
Behaviour of coal: Worked well in producer, giving uniform gas with very little poking
Average time between poking: 4 hours, 45 minutes.
Clinker: No trouble recorded.
Tar: None.

State of engine valves at end of trial: Did not need cleaning.
Valves last cleaned: Dec. 9, 1908.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·5%
Carbon	64·7%
Nitrogen	1·1%
Oxygen	19·6%
Sulphur	0·7%
Total carbon contained by dry coal charged	827·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	11·6%
Oxygen	1·0%
Carbon monoxide	13·3%
Hydrogen	14·0%
Methane	3·6%
Ethylene	0·1%
Nitrogen	56·4%

Remarks.

Neither tar washer nor sawdust scrubber used. No steam to producer. Only sufficient coal available for 19 hours run.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1278
32.	Combustible charged during trial	lbs.	1113
33.	Average B.H.P. of engine during trial	H.P.	31·94
34.	“ indicated H.P. of engine during trial	H.P.	42·8
35.	“ H.P. taken by exhauster and gas washer	H.P.	2·5
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	31·94
37.	“ “ corresponding to total gas produced	H.P.	31·3
38.	“ “ “ “ “ and available for outside use, allowing for power used	H.P.	28·8

Hourly Quantities.

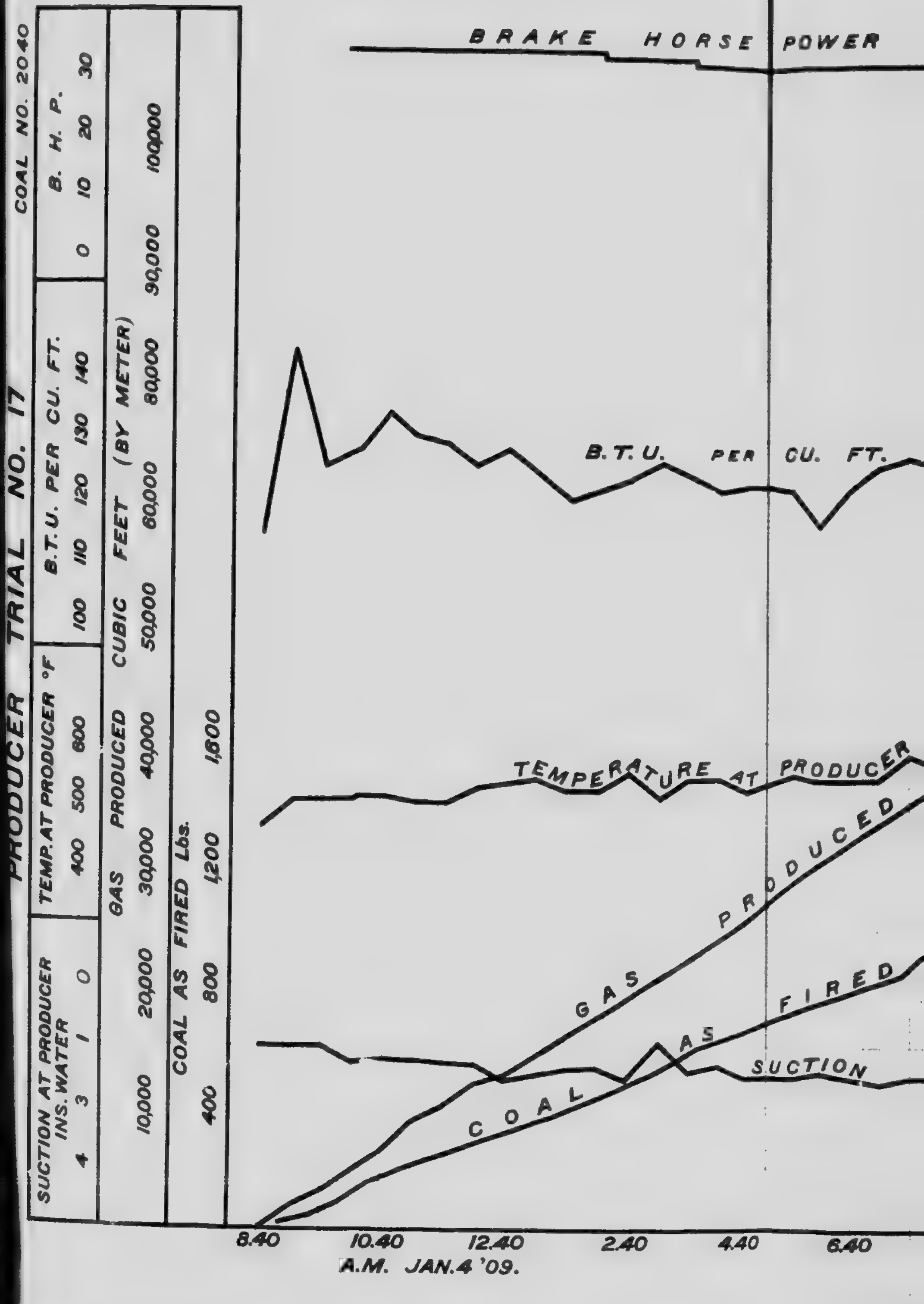
39.	Coal charged per hour	lbs.	77·7
40.	Dry coal charged per hour	lbs.	67·3
41.	Combustible charged per hour	lbs.	58·6
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	19·4
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	16·6
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	14·6
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	6·2
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	0
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3117
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3019
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3184
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3085
51.	Calorific value of coal charged per hour	B.T.U.	727500
52.	“ “ gas produced per hour (lower value)	B.T.U.	324100
53.	Steam used in producer per hour	lbs.	0

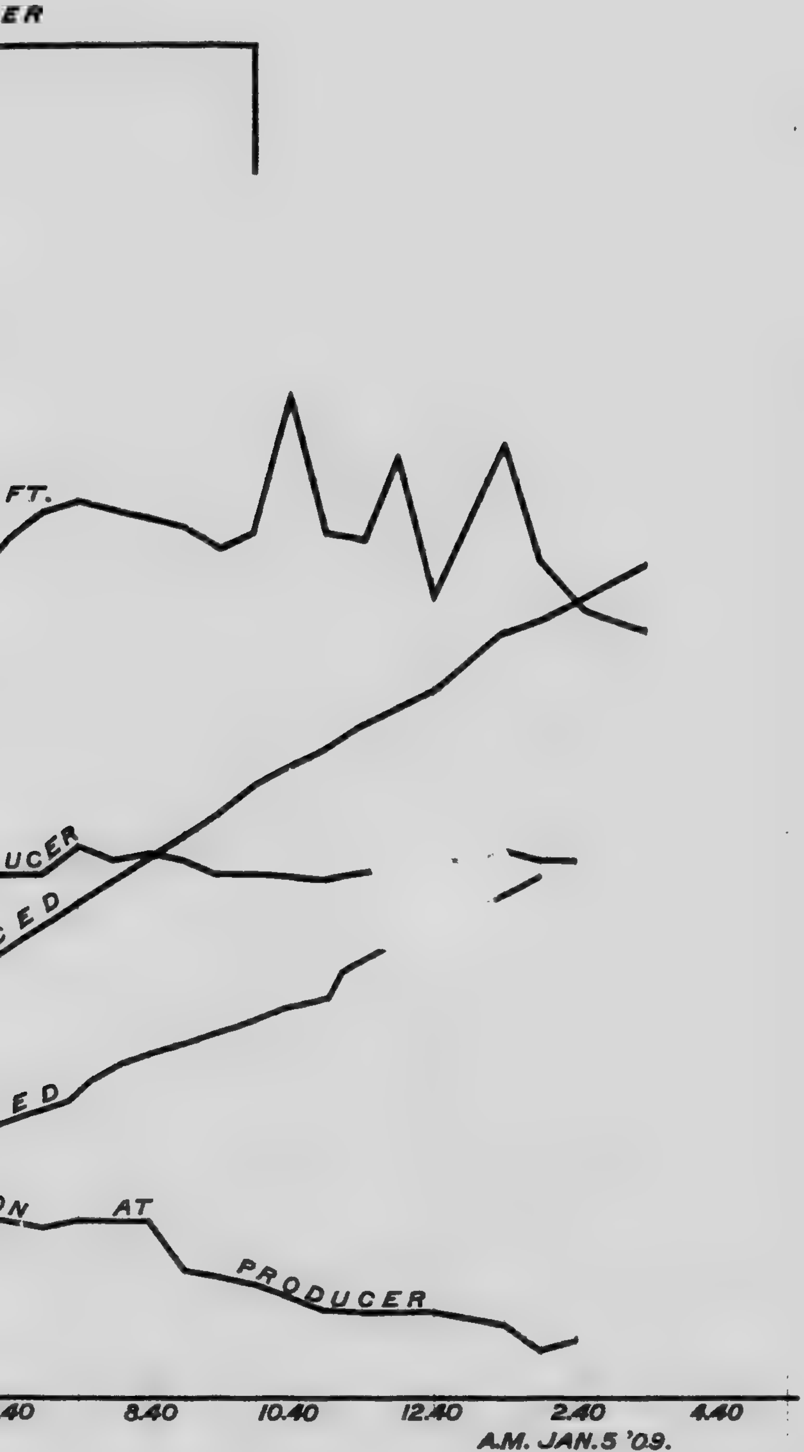
Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub ft.	38·8
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	44·9
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	51·5
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	72·1
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	96·6
59.	Steam used in producer per lb. coal charged	lbs.	0
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	11·15
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	278
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent	48·8
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	44·8
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	
65.	Thermal efficiency of engine, based on B.H.P	per cent.	22·5
66.	Over all efficiency of producer and engine plant	per cent.	10·95
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	11340
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	23240

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·48	2·15	1·87
70.	Pounds per hour charged into producer per B.H P. available for outside use and allowing for power used by auxiliaries	2·70	2·34	2·04
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·70	2·34	2·04

PRODUCER TRIAL NO. 17 COAL NO. 2040


PRODUCER TRIAL NO. 17
COAL NO. 2040
SUCTION AT PRODUCER INS. WATER 4 3 1 0
TEMP. AT PRODUCER °F 400 500 600
B.T.U. PER CU. FT. 100 110 120 130 140
B. H. P. 0 10 20 30
GAS PRODUCED CUBIC FEET (BY METER) 10,000 20,000 30,000 40,000 50,000 60,000 80,000 90,000 100,000
COAL AS FIRED Lbs. 400 800 1,200 1,600
BRAKE HORSE POWER
B.T.U. PER CU. FT.
TEMPERATURE AT PRODUCER
GAS PRODUCED
COAL AS FIRED
SUCTION
8.40
10.40
12.40
2.40
4.40
6.40
A.M. JAN. 4 '09.



APPENDIX III VOL.V

EDMONTON COAL FIELD.

ALBERTA.

TRIAL OF No. 4 PRODUCER WITH COAL No. 42

Date—December 10 and 11, 1908.

Trial Number—15.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	30·14 inches
" " 9 a.m., Dec. 11	29·78 "
" " end of trial	29·41 "
Water meter 9 p.m., Dec. 10	43,062 imperial gallons
" " 8 p.m., " 11	45,321 " "
Difference, in 23 hours	2,259 " "
Brick in producer base	1,080 lbs.
Average level of coal surface below top plate of producer	20 inches.

TIME.	
5 00 p.m., Dec. 10	Fire lighted, charged 8 lbs. shavings, 50 lbs. wood, and 165 lbs. of coke.
5 45 " " "	Charged 160 lbs. coal.
6 45 " " "	" 300 lbs. "
8 00 " " "	Down-draft with fan discharging to the atmosphere.
8.15 " " "	Charged 75 lbs. coal.
8.20 " " "	Down-draft with exhauster.
8.30 " " "	Engine started.
8.45 " " "	Trial commenced.
8 45 " " 11	Trial finished.

The gas washer and sawdust scrubber were not used

This coal gave no trouble from clinker or tar, and required very little poking.

During the trial 245 lbs. (dry weight) of refuse removed from the producer

After the trial 1,160 lbs. (dry weight) refuse removed from the producer.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—December 10 and 11, 1908. Trial Number—15.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 p.m.....	11·0	0·2	0·0	15·1	3·7	13·8	56·2	32·6
10.00 "	10·8	0·2	0·0	15·9	3·3	13·8	56·0	33·0
11.00 "	10·4	0·5	0·0	16·5	3·5	13·0	56·1	33·0
12.00 "	10·7	0·3	0·1	16·3	3·4	13·7	55·5	33·5
1.00 a.m.....	10·7	0·4	0·1	15·5	3·3	14·1	55·9	33·0
2.00 " ...	9·6	3·2	0·0	14·7	2·5	6·7	63·3	23·9
3.00 "	10·3	0·3	0·0	16·8	3·1	14·3	55·2	34·2
4.00 "	9·3	2·6	0·3	15·0	2·3	6·4	64·1	24·0
5.00 "	10·9	0·3	0·0	16·5	3·4	13·4	55·5	33·3
6.00 "	13·9	2·0	0·4	9·5	3·7	10·5	60·0	24·1
7.00 "	10·7	0·4	0·1	15·5	2·9	13·6	56·8	32·1
8.00 "	10·3	0·2	0·1	17·0	3·3	14·0	55·1	34·4
9.00 "	10·0	0·7	0·0	15·6	3·4	11·8	58·5	30·8
10.00 "	10·0	0·4	0·0	16·8	3·4	12·6	56·8	32·8
11.00 "	12·3	0·2	0·1	12·8	4·5	12·1	58·0	29·5
12.00 noon....	11·7	0·4	0·0	13·5	5·2	15·0	54·2	33·7

OBSERVATIONS OF GAS METER AND B.H.P.

Date—December 10 and 11, 1908. Trial Number—15.

Notes: B.O. indicates that there is a surplus amount of gas blowing off to the atmosphere. N.B.O. indicates that all the gas is passing to the engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
8.45 p.m.	1108100	....	B.O.	....	325	127	198	68850
9.15 "	1109787	1607	"	....	325	127	198	....
9.45 "	1111355	1568	N.B.O.	....	325	127	198	75254
10.15 "	1112935	1580	"	....	325	127	198	....
10.45 "	1114655	1720	"	....	325	127	198	....
11.15 "	1116150	1495	"	....	325	127	198	85081
11.45 "	1117840	1690	"	....	325	127	198	....
12.15 a.m.	1119420	1580	"	....	325	127	198	....
12.45 "	1120980	1560	"	....	325	127	198	....
1.15 "	1122660	1680	"	....	325	127	198	....
1.45 "	1124245	1585	"	....	325	127	198	....
2.15 "	1125755	1508	"	....	325	127	198	04920
2.45 "	1127425	1672	"	....	325	127	198	....
3.15 "	1128900	1475	"	....	325	127	198	....
3.45 "	1130480	1580	"	....	325	127	198	....
4.15 "	1132062	1582	"	....	325	127	198	17968
4.45 "	1133640	1588	"	....	325	127	198	....
5.15 "	1135125	1485	"	....	325	127	198	....
5.45 "	1136545	1420	"	....	325	127	198	....
6.15 "	1138065	1520	"	....	325	138	187	30971
6.45 "	1139645	1580	"	....	325	138	187	....
7.15 "	1141205	1560	"	....	325	138	187	....
7.45 "	1142730	1525	"	....	325	138	187	....
8.15 "	1144350	1620	"	....	325	138	187	....
8.45 "	1145825	1475	"	....	325	138	187	....
9.15 "	1147380	1555	"	....	325	138	187	....
9.45 "	1148920	1540	"	....	325	135	190	....
10.15 "	1150400	1480	"	....	325	135	190	....
10.45 "	1151824	1424	"	....	325	135	190	....
11.15 "	1153520	1696	"	....	325	135	190	....
11.45 "	1155020	1500	"	....	325	135	190	....
12.15 a.m.	1156590	1570	"	....	325	135	190	....
12.45 "	1158160	1570	"	....	325	135	190	....
1.15 "	1159730	1570	"	....	325	135	190	....
1.45 "	1161318	1588	"	....	325	135	190	....
2.15 "	1162960	1642	"	....	325	135	190	....
2.45 "	1164620	1660	"	....	325	135	190	86700
3.15 "	1166180	1560	"	....	325	135	190	....
3.45 "	1167920	1740	"	....	325	135	190	....
4.15 "	1169454	1534	"	....	325	135	190	....
4.45 "	1171090	1636	"	....	325	135	190	....
5.15 "	1172570	1480	"	....	325	135	190	....
5.45 "	1174150	1580	"	....	325	135	190	....
6.15 "	1175800	1650	"	....	325	135	190	....
6.45 "	1177260	1460	"	....	325	135	190	....
7.15 "	1178920	1660	"	....	325	135	190	....
7.45 "	1180320	1400	"	8.00	325	135	190	21140
8.15 "	1181920	1600	"	....	325	135	190	....
8.45 "	1183475	1555	"	....	325	135	190	26070

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—December 10 and 11, 1908. Trial Number—15.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.45 p.m.	44	$\frac{5}{12}$	6·22	14·88	1610	132·5	8.45 a.m.			
9.15 "	47	$\frac{5}{12}$	6·42	13·98	1825	131·0	9.15 "	25	25	
9.45 "	49	½	6·60	13·31	1650	131·5	9.40 "	25	50	
10.15 "	51	½	6·94	12·98	1810	129·0	10.05 "	25	75	
10.45 "	52	½	7·14	16·69	1660	125·6	10.20 "	50	125	
11.15 "	53	½	7·42	16·98	1720	130·1	10.55 "	50	175	
11.45 "	54	½	7·58	16·89	1765	130·2	11.25 "	50	225	
12.15 a.m.	56	½	7·69	16·69	1805	128·8	12.00 p.m.	50	275	
12.45 "	57	½	7·78	18·81	1715	128·5	12.35 "	50	325	
1.15 "	58	½	8·05	17·88	1610	125·2	1.15 "	75	400	
1.45 "	58	½	8·05	17·65	1643	125·0	2.10 "	50	450	
2.15 "	59	½	8·27	16·02	1665	128·7				
2.45 "	60	½	8·32	17·27	1710	121·2	2.45 "	75	525	
3.15 "	61	½	8·58	17·65	1715	123·3				
3.45 "	61	½	8·68	17·58	1738	122·5	3.25 "	25	550	
4.15 "	63	½	8·66	18·13	1732	130·0	4.10 "	75	625	4.10 p.m.
4.45 "	63	½	8·02	17·59	1740	132·0	4.40 "	25	650	
5.15 "	62	½	7·25	16·87	1695	129·2	5.10 "	50	700	5.30 "
5.45 "	64	½	6·83	16·29	1675	125·5	5.40 "	50	750	
6.15 "	60	½	7·12	16·90	1660	128·7	6.05 "	50	800	6.00 "
6.45 "	60	½	7·07	16·59	1675	126·3	6.25 "	25	825	
7.15 "	59	½	6·99	16·22	1690	123·5	6.45 "	25	850	
7.45 "	59	½	6·97	15·60	1760	120·2	7.15 "	50	900	
8.15 "	60	½	7·30	16·92	1760	134·2	8.15 "	50	950	8.15 "
8.45 "	60	½	7·45	16·36	1780	125·7				
9.15 "	59	½	7·53	16·86	1760	130·1	9.10 "	125	1075	
9.45 "	59	½	7·51	16·54	1785	127·6				9.45 "
10.15 "	59	½	7·66	16·94	1780	130·8	10.15 "	50	1125	
10.45 "	59	½	8·15	17·37	1810	132·2	10.45 "	50	1175	
11.15 "	59	½	8·23	17·08	1800	126·2	11.15 "	50	1225	
11.45 "	60	½	8·52	17·24	1852	128·0	11.40 "	50	1275	
12.15 p.m.	60	½	8·40	16·82	1845	123·0	12.20 a.m	50	1325	
12.45 "	58	½	7·30	16·71	1805	134·6	12.40 "	25	1350	
1.50 "	60	½	7·82	16·40	1860	126·4	1.15 "	25	1375	
1.45 "	60	½	8·30	17·35	1840	132·0				
2.15 "	60	½	8·56	16·92	1860	123·3	2.10 "	25	1400	
2.45 "	59	½	8·35	16·59	1900	124·0				
3.15 "	59	½	8·46	16·70	1915	125·0	3.00 "	50	1450	
3.45 "	60	$\frac{5}{12}$	8·63	15·47	1630	106·0	3.45 "	50	1500	3.45 a.m.
4.15 "	59	½	6·66	15·41	1920	133·0	4·00 "	50	1550	
4.45 "	58	$\frac{5}{12}$	6·75	14·92	1760	136·6	4.15 "	25	1575	
5.15 "	58	$\frac{5}{12}$	7·16	15·33	1660	128·9	4.30 "	50	1625	5.15 "
5.45 "	60	$\frac{5}{12}$	8·01	16·17	1720	133·4	5.00 "	25	1650	5.45 "
6.15 "	61	$\frac{5}{12}$	8·10	16·51	1670	133·5	5.15 "	25	1675	6.15 "
6.45 "	62	$\frac{5}{12}$	8·51	15·77	1825	125·8	5.40 "	50	1725	6.45 "
7.15 "	63	$\frac{5}{12}$	8·91	16·81	1850	138·8	6.45 "	75	1800	
7.45 "	64	$\frac{5}{12}$	9·41	18·16	1655	137·5	7.40 "	50	1850	7·40 "
8.15 "	65	$\frac{5}{12}$	9·13	17·93	1670	130·1	8.10 "	75	1925	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date— December 10 and 11, 1908. Trial Number—15.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.45 p.m.	700	47	44	58	4·0	6·4	6·5	4·9	Gas washer not used	0·5	No steam was used	
9.15 "	700	49	54	100	3·5	5·0	5·2	5·0		0·6		
9.45 "	680	52	56	136	3·5	5·0	5·2	5.0		0·4		
10.15 "	670	54	58	141	3.6	5·2	5·4	5·3		0·7		
10.45 "	650	56	58	144	3·5	5·1	5·3	4·8		0·5		
11 15 "	630	57	59	143	3·4	5·1	5·3	4·8		0·5		
11.45 "	620	53	60	140	3·5	5·2	5·4	4·9		0·6		
12.15 a.m.	620	59	61	136	3·5	5·2	5·4	5·0		0·8		
12 45	620	60	62	135	3·4	5·2	5·4	5·2		0·9		
1.15 "	650	61	63	135	3·8	6·0	6·2	5·8		0·9		
1 45 "	620	62	62	138	3·2	5·0	5·2	5·2		1·0		
2 15 "	600	63	64	128	3·1	4·9	5·1	5·1		0·9		
2.45 "	610	63	64	129	3·4	5·7	5·9	5·2		1·0		
3 15 "	590	64	65	131	3·1	4·9	5·1	5·0		0·8		
3 45 "	600	65	65	130	3·3	5·1	5·3	5·2		1·0		
4 15 "	600	65	66	128	3·2	5·2	5·4	5·2		1·0		
4.45 "	580	65	66	128	3·3	5·2	5·4	5·2		1·0		
5 15 "	580	63	57	128	3·2	4·7	4·9	5·0		1·0		
5 45 "	590	61	54	126	3·2	5·0	5·2	5·6		1·5		
6 15 "	600	60	57	124	3·2	5·0	5·2	5·6		1·3		
6 45 "	590	59	57	126	3·2	5·0	5·2	5·3		1·3		
7 15 "	580	59	56	124	3·2	5·0	5·2	5·2		1·2		
7 45 "	570	58	56	125	3·3	5·1	5·3	5·4		1·3		
8.15	580	58	59	138	3·2	5·0	5·3	5·9		1·4		
8 45 "	580	59	60	144	3·3	5·1	5·3	5·5		1·5		
9 15 "	570	60	58	142	3·3	5·1	5·3	5·7		1·7		
9.45 "	580	59	56	145	3·2	5·0	5·2	5·8		1·8		
10 15 "	560	59	58	144	3·2	5·0	5·2	5·8		1·8		
10 45 "	550	60	58	148	3·0	4·8	5·1	5·4		1.6		
11 15 "	600	61	60	130	3·2	5·0	5·2	5·7		1·7		
11 45 "	600	61	60	124	3·2	5·0	5·2	6·3		2·1		
12 15 p.m.	580	61	61	124	3·2	5·0	5·2	5·7		1·6		
12 45 "	570	62	55	123	3·2	5·0	5·2	5·7		1·6		
1 15 "	560	61	60	125	3·3	5·0	5·2	5·9		1·7		
1 45 "	560	61	60	123	3·1	4·6	4·8	5·7		2·0		
2 15 "	550	62	60	126	3·2	4·5	4·7	5·0		1·4		
2 45 "	570	61	58	124	3·4	5·7	5·9	6·2		2·0		
3 15 "	560	61	60	124	3·3	5·0	5·3	6·0		1·9		
3 45 "	580	61	62	124	3·3	5·3	5·5	7·0		3·0		
4 15	580	61	50	135	3·0	5·0	5·2	5·6		1·7		
4 45 "	600	60	55	132	3·3	5·3	5·5	6·9		2·5		
5 15 "	570	59	55	130	3·0	4·0	4·3	6·0		2·0		
5 45 "	580	61	63	130	3·3	5·2	5·4	6·5		2·5		
6 15 "	590	62	64	128	3·3	5·0	5·2	7·0		2·5		
6 45 "	600	63	65	130	3·1	5·0	5·2	6·1		1·7		
7·15 "	560	64	66	130	3·1	4·4	4·6	5·0		1·0		
7 45 "	540	65	67	132	3·1	4·4	4·6	6·1		2·0		
8·15 "	550	66	69	130	3·1	4·5	4·7	6·9		2·7		
8·45 "	550	66	70	130	3·2	4·7	4·9	6·9		2·8		

PRODUCER TRIAL No. 15.

Date—December 10-11, 1908. Producer No. 4, at McGill University.

Time of lighting up—5 p.m. Trial commenced 8.45 p.m. December 10; ended 8.45 p.m. December 11.

Duration of trial—24 hours. Kind of fuel—No. 42 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Killam, Gardner, Ford.

Chemists—Campbell, Nicolls, Stansfield.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1925
2.	Moisture in coal as charged	per cent.	17·3
3.	Calorific value of coal as charged, per lb	B.T.U.	89·40
4.	" " of dry coal per lb	B.T.U.	10910
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 42·8; volatile matter, 28·7; ash, 11·2; moisture, 17·3	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 28·9; volatile matter, 8·4 Total	per cent.	37·3
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	39·6

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	75375
9.	Average temperature of gas leaving producer	°F.	594
10.	" " " at meter	°F.	61
11.	Average temperature of air in producer house	°F.	60
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	128·10
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	130·00
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	119·50
14.	Average barometric pressure	lbs. sq in.	14·60
15.	" suction at producer	ins. of water	1·50
16.	" suction at exhauster	ins. of water	5·60
17.	" pressure of gas at meter	ins. of water	4·15

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	0
19.	" water used in scrubber and gas washer	lbs.	30060
20.	" tar extracted in scrubber and gas washer	lbs.	. .
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	. .

ENGINE.

23.	Total revolutions during trial (from counter)		314400
24.	Average explosions per minute		103·1
25.	Average effective load on brake	lbs.	192·6
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	72·1

28. **Notes.**

Fire poked at: 4.10, 5.30, 6.00, 8.15, 9.45 a.m.; 3.45, 5.15, 5.45, 6.15, 6.45, 7.40 p.m.
Refuse removed at: 5.55, 6.10, 6.40, 9.00, 9.50 a.m.; 1.45, 3.50, 4.00, 5.00, 6.45 p.m.
Behaviour of coal: Easy to work.
Average time between poking: 2 hours, 11 minutes.
Clinker: Not troublesome.
Tar: Not troublesome.
State of engine valves at end of trial: Did not need cleaning.
Valves last cleaned.: Dec. 9, 1908.

29. ANALYSIS OF DRY COAL.

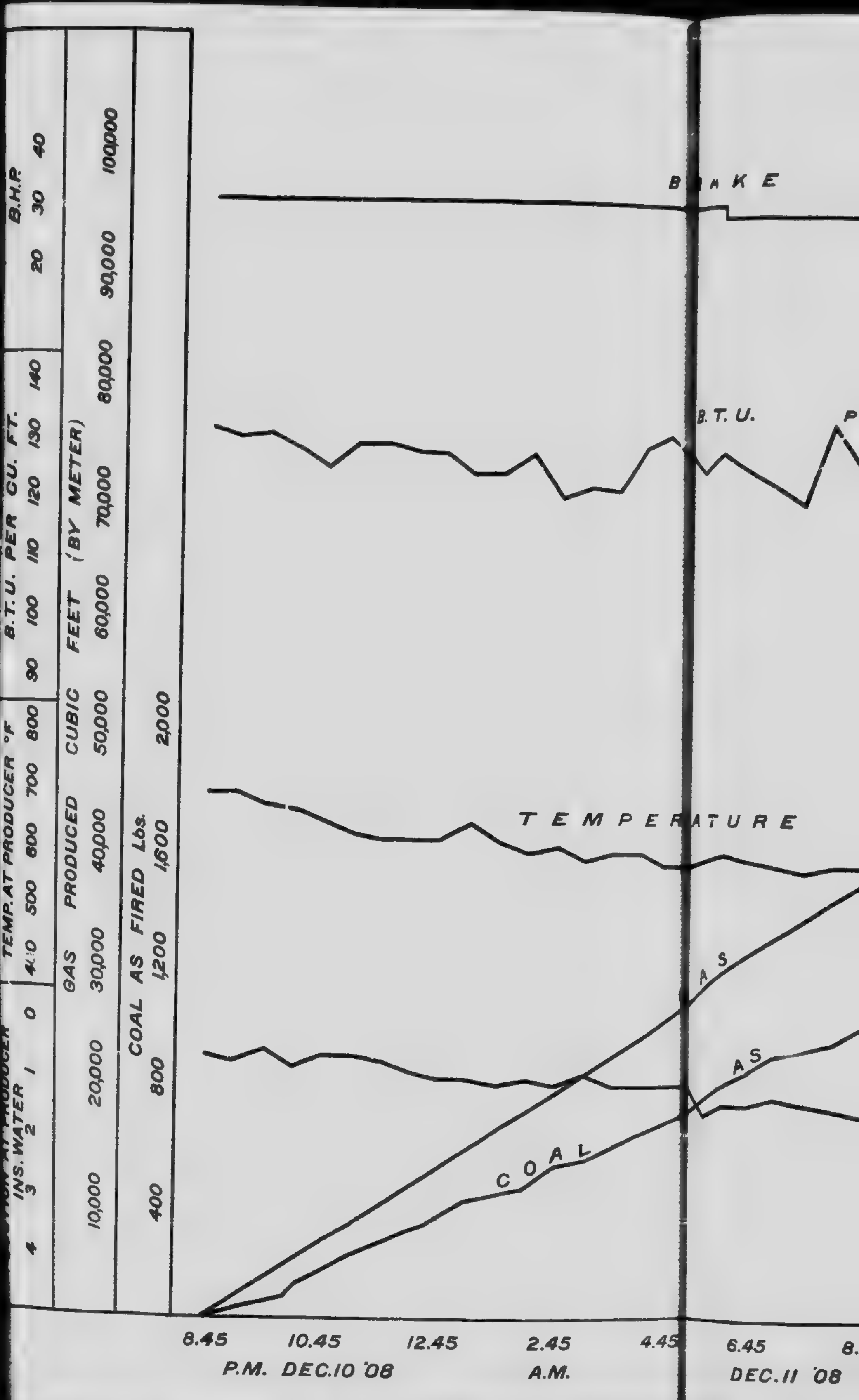
Hydrogen	4·6%
Carbon	65·3%
Nitrogen	1·2%
Oxygen	17·6%
Sulphur	0·4%
Total carbon contained by dry coal charged	1038·0 lbs.

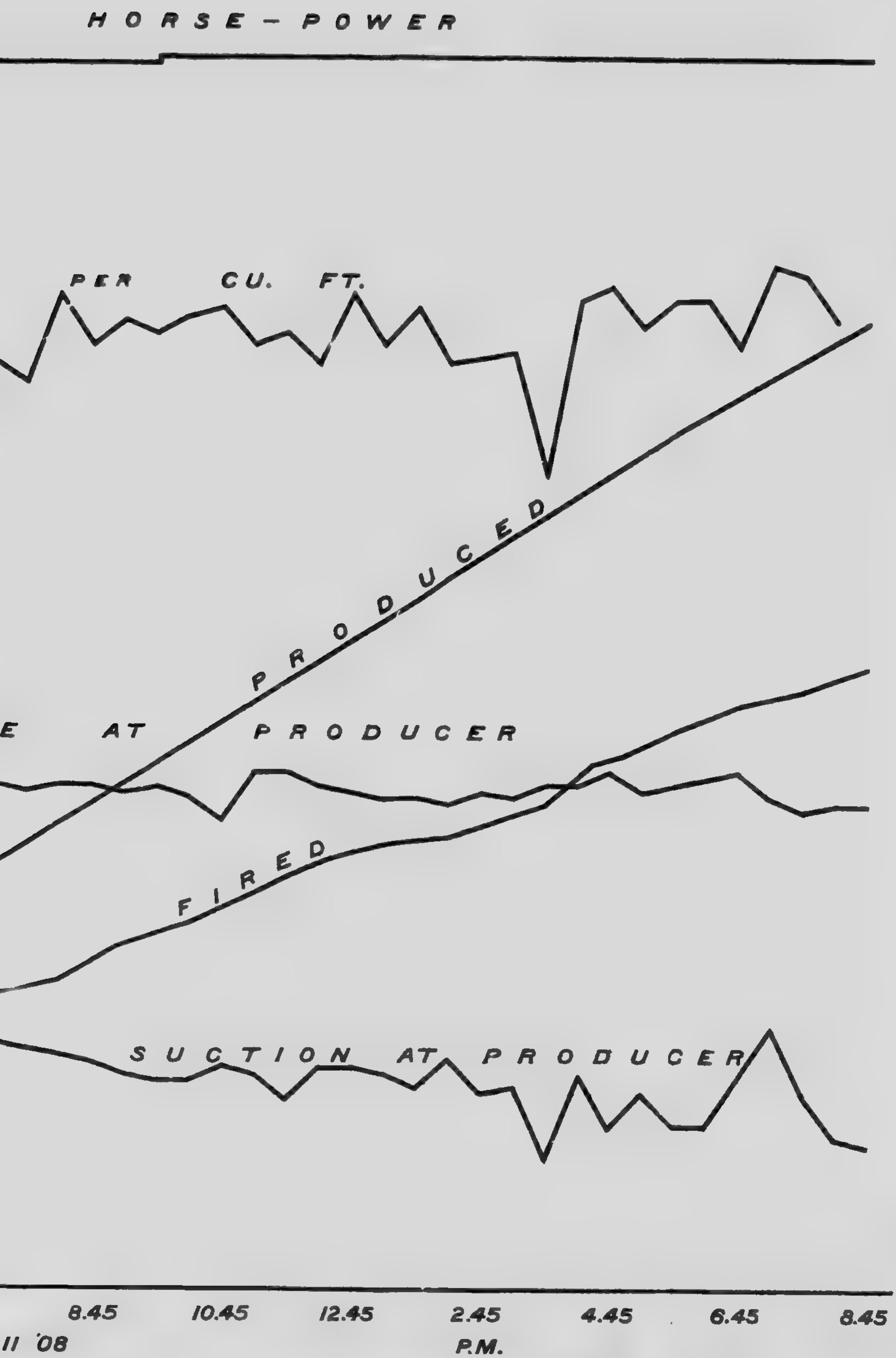
30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	11·02%
Oxygen	0·63%
Carbon monoxide	14·5 %
Hydrogen	12·9 %
Methane	3·7 %
Ethylene	0·05%
Nitrogen	57·2 %

PRODUCER TRIAL NO. 15

COAL NO. 42


B.H.P. 20 30 40
B.T.U. PER CU. FT. 90 100 110 120 130 140
TEMP. AT PRODUCER °F 400 500 600 700 800
INS. WATER 4 3 2 1 0
GAS PRODUCED CUBIC FEET (BY METER) 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs. 400 800 1,200 1,600 2,000
BRAKE
B.T.U.
P
TEMPERATURE
AS
AS
COAL
8.45
10.45
12.45
2.45
4.45
6.45
8.
P.M. DEC.10 '08
A.M.
DEC.11 '08



APPENDIX III VOL.V

Remarks.

This coal seems well fitted for producer work and supplied all the gas required, giving no trouble from clinker or tar. Very little poking was required. The gas given off was of uniform value and kept the engine running at a constant load throughout the whole trial.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	1590
33.	Average B.H.P. of engine during trial	lbs.	1377
34.	" indicated H.P. of engine during trial	H.P.	30·74
35.	" H.P. taken by exhauster and gas washer	H.P.	42·50
36.	" B.H.P. while gas consumption of engine was taken	H.P.	2·5
37.	" " corresponding to total gas produced	H.P.	30·74
38.	" " " " " " and	H.P.	30·74
	available for outside use, allowing for power used	H.P.	28·24

Hourly Quantities.

39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	80·2
41.	Combustible charged per hour	lbs.	66·2
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	57·4
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	20·1
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	16·5
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	14·4
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	6·52
47.	Gas (by meter) supplied by producer per hour	lbs.	0
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3140
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3086
50.	Gas (dry at 60° and 14·7 lbs per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3140
51.	Calorific value of coal charged per hour	cub. ft.	3086
52.	" " gas produced per hour (lower value)	B.T.U.	717000
53.	Steam used in producer per hour	B.T.U.	368800
		lbs.	0

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	38·5
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	46·6
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	53·8
58.	" " " " " " B.H.P. "	cub. ft.	72·7
59.	Steam used in producer per lb. coal charged	cub. ft.	100·4
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	.....
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	15·6
62.	Efficiency of process of gas production and cleaning, based on coal charged	lbs.	399·5
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	51·40
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	47·2
65.	Thermal efficiency of engine, based on B.H.P	per cent.	....
66.	Over all efficiency of producer and engine plant	per cent.	21·2
67.	Calorific value of gas supplied to engine per B.H.P. per hour	per cent.	10·9
68	" " coal charged into producer per B.H.P. per hr.	B.T.U.	12000
		B.T.U.	23330

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine			
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·61	2·15	1·86
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·84	2·34	2·03
		2·84	2·34	2·03

TRIAL OF No. 4 PRODUCER WITH COAL No. 45

Date—November 23 and 24, 1908. **Trial Number—10.**

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·81 inches.
" " 9 a.m.	29·80 "
" " end of trial	29·93 "
Water meter 9 p.m., Nov. 23	29,211 imperial gallons
Water meter 4 p.m., " 24	30,341 " "
Difference, in 19 hours	1,130 " "
Brick in producer base	735 lbs.
Average level of coal surface below top plate of producer	16 inches.

TIME.	
3.30 p.m., Nov. 23	Fire lighted. Charged 8 lbs. excelsior, 53 lbs. wood; 125 lbs. coke.
7.30 " " "	Down-draft with fan exhausting to the atmosphere.
8.05 " " "	Down-draft with exhauster.
8.15 " " "	Engine started.
8.20 " " "	Trial commenced, 785 lbs. of coal charged up to this point.
6.35 a.m., " 24 6.55 " " "	Engine stopped to change the position of the magneto.
11.20 " " "	Producer poked round the edges, there being a tendency to arch.
4.20 p.m., " "	Trial finished. This trial was curtailed owing to an insufficient supply of No. 45 coal.

After 11 p.m. the explosion counter was out of order.
The coal showed a slight tendency to clinker, but was easily worked.
Weight of refuse removed 1,282 lbs. after drying.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—November 23 and 24, 1908.

Trial Number 10.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent	per cent.	per cent.	per cent.
9 00 p.m.	9·6	1·8	0·1	14·7	3·9	11·2	58·7	29·9
10 00 "	10·8	0·6	0·0	15·0	4·3	15·0	56·9	31·7
11 00 "	10·2	0·4	0·0	16·4	3·4	13·7	55·9	33·5
12 00 "	10·7	0·6	0·0	14·8	3·7	13·8	56·4	32·3
1 00 a.m.	11·0	0·4	0·0	15·0	3·6	13·5	56·5	32·1
2.00 "	12·9	0·5	0·9	13·6	3·5	15·0	54·5	32·1
3 00 "	10·6	0·5	0·0	15·3	3·0	10·2	60·4	28·5
4.00 "	11·8	0·5	0·1	13·8	4·4	12·6	56·8	30·9
5 00 "	9·8	0·4	0·0	16·3	2·4	16·8	60·3	29·5
6 00 "	11·5	0·3	0·0	15·3	3·5	13·0	56·4	31·8
7 00 "	10·5	1·7	0·0	14·2	3·2	11·7	58·7	29·1
8 00 "	9·3	0·3	0·0	19·0	3·5	15·2	52·7	37·7
9 00 "	9·2	0·5	0·0	20·7	3·3	16·3	50·2	40·3
10 00 "	14·0	0·3	0·0	11·9	4·6	19·4	49·8	35·9
11 00 "	11·8	0·6	0·0	13·8	4·2	13·5	56·1	31·5
12 00 "	11·8	0·7	0·1	13·8	4·2	12·7	56·7	30·8
1 00 p.m.	11·9	0·9	0·0	13·4	3·7	15·9	54·2	33·0
2 00 "	10·7	0·7	0·0	15·0	3·8	13·1	56·7	31·9
3 00 "	11·8	0·7	0·0	14·6	3·9	15·7	53·3	34·2
4.00 "	13·3	0·3	0·0	14·8	3·5	15·0	53·1	33·3

OBSERVATIONS OF GAS METER AND B. H. P.

Date—November 23 and 24, 1908 Trial Number—10

Notes: B.O. indicates that there is a surplus amount of gas blowing off to atmosphere N.B.O. indicat that all the gas is passing to the gas engine

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.20 p.m....	747595	...	......	325	140	185	55430
8.50 “ ..	749545	1950	B.O.	325	140	185	..
9.20 “ ..	751545	2000	“	325	140	185	
9.50 “	753350	1805	“	325	140	185	
10.20 “	755090	1740	“	325	140	185	
10.50 “	756740	1650	“	325	140	185	
4.20 “ ..	758290	1550	“	325	140	185	
11.50 “ ..	759760	1570	N.B.O.	325	140	185	
12.20 a.m.	761195	1435	“	325	140	185	
12.50 “ ..	762675	1480	“	325	140	185	
1.20 “ ..	764131	1456	“	325	140	185	
1.50 “ ..	765598	1467	“	325	140	185	
2.20 “ ..	767061	1463	B.O.	325	140	185	
2.50 “ ..	768465	1404	N.B.O.	325	140	185	
3.20 “ ..	769975	1510	B.O.	325	140	185	
3.50 “ ..	771460	1485	“	325	140	185	
4.20 “ .	772928	1468	“	325	140	185	
4.50 “ ..	774382	1454	“	325	140	185	
5.20 “ ..	775850	1468	“	325	140	185	
5.50 “ ..	777276	1426	“	325	140	185	
6.20 “ ..	778675	1399	N.B.O.	325	140	185	20465
6.50 “ .	780030	1355	“	275	110	165	21240
7.20 “	781400	1370	“	275	110	165	
7.50 “ ..	783000	1600	B.O.	275	110	165	
8.20 “ .	784590	1590	“	275	110	165	
8.50 “ ..	786210	1620	“	300	130	170	35555
9.20 “ .	787695	1485	“	325	144	181	36282
9.50 “ .	789290	1595	“	325	144	181	
10.20 “	790620	1330	“	325	144	181	
10.50 “ .	792050	1420	“	275	110	165	45800
11.20 “	793450	1400	“	250	98	152	46834
11.50 “	794800	1350	N.B.O.	250	98	152	
12.20 p.m. .	796220	1420	“	300	120	180	54139
12.50 “ .	797670	1450	“	300	120	180	
1.20 “	799090	1420	“	300	120	180	
1.50 “ .	800535	1445	“	300	120	180	
2.20 “	802025	1490	B.O.	300	120	180	
2.50 “ .	803415	1390	“	300	120	180	
3.20 “	804755	[illegible]	N.B.O.	300	120	180	
3.50 “ .	806150	1395		300	120	180	
4.20 “ .	807730	1580	B.O.	300	120	180	80948

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—November 23 and 24, 1909. Trial Number -10.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.20 p.m.	59	$\frac{5}{12}$	9·74	16·23	2359	145				
8.50 "	60	$\frac{7}{12}$	8·24	18·92	1786	129				
9.20 "	60	$\frac{7}{12}$	8·41	18·82	1825	129				
9.50 "	62	$\frac{7}{12}$	8·32	18·75	1825	129	9.45 p.m.	50	50	
10.20 "	62	$\frac{7}{12}$	8·63	19·17	1855	133	10.00 "	50	100	
10.50 "	62	$\frac{7}{12}$	8·85	19·67	1850	135·5	10.45 "	50	150	10.45 p.m.
11.20 "	66	$\frac{7}{12}$	8·81	18·22	1976	126·0	11.20 "	50	200	
11.50 "	66	$\frac{7}{12}$	9·00	18·72	1886	124·3	11.50 "	50	250	11 30 "
12.20 a.m.	68	$\frac{7}{12}$	9·00	18·26	1875	117·7				
12.50 "	68	$\frac{7}{12}$	9·27	19·19	1855	124·5	12.40 a.m.	50	300	
1.20 "	69	$\frac{7}{12}$	9·46	18·94	1880	121·0				
1.50 "	70	$\frac{7}{12}$	9·72	19·78	1820	123·5	1.50 "	25	325	
2.20 "	70	$\frac{7}{12}$	9·84	20·02	1810	125·0	2.20 "	50	375	
2 [illegible] "	71	$\frac{7}{12}$	9·96	19·30	1865	118·2	3.05 "	50	425	
3.20 "	72	$\frac{7}{12}$	10·05	19·84	1838	122·0	3.45 "	50	475	
3.50 "	72	$\frac{7}{12}$	10·40	20·08	1830	129·0	4.15 "	50	525	
4.20 "	72	$\frac{7}{12}$	9·68	18·80	1920	122·5	4.45 "	25	550	
4.50 "	72	$\frac{7}{12}$	9·70	19·00	1865	115·7				
5.20 "	72	$\frac{7}{12}$	9·48	18·45	1895	115·6	5.30 "	50	600	5.30 a.m.
5.50 "	72	$\frac{7}{12}$	9·50	18·92	1915	122·5				
6.20 "	72	$\frac{7}{12}$	9·64	19·01	1980	126·0				
6.50 "	72	$\frac{1}{2}$	9·45	18·39	1755	124·0	6.45 "	50	650	
7.20 "	72	$\frac{1}{2}$	9·69	18·43	1685	116·5	7.15 "	25	675	
7.50 "	72	$\frac{1}{2}$	9·87	18·35	1135	116·5				
8.20 "	72	$\frac{1}{2}$	9·76	18·59	1737	121·3	8.00 "	25	700	
8.50 "	72	$\frac{1}{2}$	9·69	17·84	1760	113·5				
9.20 "	70	$\frac{1}{2}$	9·12	19·52	1670	137·5	9.20 "	50	750	
9.50 "	68	$\frac{1}{2}$	8·88	18·22	1718	127·0	9.50 "	50	800	
10.20 "	68	$\frac{1}{2}$	8·42	17·82	1720	128·0				
10.50 "	66	$\frac{1}{2}$	8·33	17·64	1727	127·0	10.45 "	50	850	
11.20 "	65	$\frac{1}{2}$	8·25	16·95	1855	127·5	11.20 "	50	900	
11.50 "	64	$\frac{1}{2}$	8·04	17·09	1850	132·3	11.40 "	50	950	11.40 "
12.20 p.m.	65	$\frac{1}{2}$	8·62	17·28	1843	126·5	12.15 p.m.	50	1000	
12.50 "	66	$\frac{1}{2}$	8·94	17·48	1720	116·0	12.50 "	50	1050	
1.20 "	67	$\frac{1}{2}$	10·03	18·84	1788	124·6				
1.50 "	68	$\frac{1}{2}$	9·18	17·95	1816	125·4				
2.20 "	69	$\frac{1}{2}$	10·07	19·68	1670	127·0	2.10 "	50	1100	
2.50 "	69	$\frac{1}{2}$	9·96	18·72	1680	116·5	2.50 "	50	1150	
3.20 "	70	$\frac{1}{2}$	9·98	20·40	1650	134·5	3.20 "	50	1200	
3.50 "	70	$\frac{1}{2}$	10·05	20·25	1630	131·5	3.45 "	61	1261	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—November 23 and 24, 1908. Trial Number- 10

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet
8.20 p.m.	570	64	74	165	3·8	6·0	6·2	7·6	6·8	1·4		
8 50 “	600	64	62	128	3·8	6·0	6·2	7·8	7·1	1·4		
9 20 “	600	65	64	142	3·7	5·8	6·0	7·4	6·7	1·3		
9.50 “	580	66	65	129	3·6	5·2	5·4	6·9	6·0	1·2		
10.20 “	570	67	70	129	3·4	5·0	5·2	6·8	5·9	1·3		
10 50 “	570	68	71	130	3·3	4·9	5·1	7·2	6·3	1·7		
11 20 “	560	69	70	128	3·3	4·8	5·0	7·0	6·0	1·7		
11 50 “	540	70	72	130	3·1	4·0	4·2	6·7	5·7	1·8		
12.20 a.m.	540	70	71	128	3·2	4·1	4·3	7·2	6·1	1·9		
12.50 “	540	71	71	128	3·1	4·0	4·3	6·9	5·8	1·8		
1.20 “	540	72	73	128	3·1	4·2	4·4	6.9	6·1	1·8		
1.50 “	540	72	74	128	3·1	4·2	4·4	6·9	6·2	1·9	60	59
2 20 “	520	72	75	128	3·1	4·2	4·4	6·1	5·1	1·3	60	59
2.50 “	500	73	75	128	3·1	4·2	4·4	6·2	5·2	1·2	62	61
3 20 “	510	73	75	126	3·1	4·2	4·4	6·2	5·2	1·2		
3.50 “	530	73	74	125	3·1	4·2	4·4	6·6	5·7	1·7		
4.20 “	510	72	73	129	3·2	4·3	4·5	6·6	5·7	1·8		
4 50 “	500	72	72	131	3·1	4·3	4·5	6·8	5·9	1·8		
5 20 “	500	72	71	127	3·2	4·3	4·5	6·7	5·9	1·8		
5 50 “	490	72	71	128	3·2	4·3	4·5	6·7	5·9	1·8		
6 20 “	490	72	71	126	3·1	4·2	4·4	6·2	5·3	1·6		
6.50 “	480	72	70	112	3·1	4·2	4·4	6·2	5·3	1·5		
7.20 “	500	72	72	123	3·3	4·5	4·7	6·8	6·1	1·7		
7.50 “	600	72	72	122	3·3	4·6	4·8	6·8	5·7	1·9		
8 20 “	500	72	73	126	3·3	5·0	5·2	7·4	6·6	1·9		
8 50 “	490	72	73	124	3·2	4·6	4·8	6·7	5·9	1·8		
9 20 “	510	71	66	129	3·2	4·3	4·5	6·0	5·0	1·2		
9 50 “	520	70	63	129	3·2	4·4	4·6	6·2	5·2	1·1		
10 20 “	510	68	63	130	3·2	4·4	4·6	6·5	5·5	1·6		
10 50 “	500	68	62	126	3·2	4·4	4·6	6·6	5·7	1·8		
11.20	490	67	60	130	3·1	4·1	4·3	7·1	6·4	2·8		
11 50 “	490	66	60	128	3·1	4·2	4·4	7·3	6·4	2·5		
12 20 p.m	490	67	63	125	3·1	4·3	4·5	7·4	6·2	2·4		
12 50 “	500	67	67	129	3·1	4·3	4·5	7·3	6·2	2·5		
1 20 “	500	68	66	130	3·1	4·3	4·5	7·3	6·2	2·3		
1 50 “	490	69	72	131	3·1	4·3	4·5	7·4	6·1	2·4		
2 20 “	490	70	72	130	3·2	4·4	4·6	7·0	6·0	2·0		
2 50 “	480	71	73	126	3·2	4·4	4·6	6·8	6·0	2·0		
3 20 “	470	71	73	132	3·1	4·3	4·5	6·8	6·0	2·1		
3 50 “	500	72	73	137	3·1	4·5	4·7	7·3	6·4	2·0		
4 20 “	500	72	72	135	3·1	4·5	4·7	7·3	6·4	2·1		

PRODUCER TRIAL No. 10.

Date—November 23-24, 1908. Producer No. 4, at McGill University.
Time of lighting up—3.30 p.m. Trial commenced 8.20 p.m., November 23; ended 4.20 p.m. November 24.
Duration of trial—20 hours. Kind of fuel—No. 45 coal.
Observers and staff during trial—Cameron, Killam, Gardner
Computers—Cameron, Killam.
Chemists—Campbell, Stansfield, Nicolls.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial		
2.	Moisture in coal as charged	lbs.	1261
3.	Calorific value of coal as charged, per lb.	per cent.	15·3
4.	“ “ of dry coal per lb.	B.T.U.	9610
5	Proximate analysis of coal as charged (by weight): fixed carbon, 46·0; volatile matter, 31·2; ash, 7·5; moisture, 15·3	B.T.U. per cent.	11360
6.	Combustible in dry refuse removed during trial: fixed carbon, —; volatile matter, —	per cent.	....
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	44

Gas.

8.	Total gas produced during trial (from meter readings)		
9.	Average temperature of gas leaving producer	cub. ft.	60135
10	“ “ “ at meter	°F.	517
11.	Average temperature of air in producer house	°F.	70
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	°F.	70
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	124·5
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	129·5
14	Average barometric pressure	B.T.U.	118·6
15.	“ suction at producer	lbs. sq in.	14·63
16.	“ suction at exhauster	ins. of water	1·8
17.	“ pressure of gas at meter	ins. of water	6·9
		ins. of water	3·8

Steam, Water, Etc.

18.	Total steam used in producer during trial		
19.	“ water used in scrubber and gas washer	lbs.	0
20.	“ tar extracted in scrubber and gas washer	lbs.	16700
21.	Average power required to drive exhauster	lbs.	
22.	“ “ “ gas washer	H.P. H.P.	2·5 1·0

Engine.

23.	Total revolutions during trial (from counter)		
24.	Average explosions per minute—explosion counter out of order		251036
25.	Average effective load on brake		
26.	Effective radius of brake wheel	lbs.	....
27	Average mean effective pressure from indicator diagrams	ft. lbs. sq. in.	3·836 61·7
28.			

Notes.

Fire poked at. 10.45, 11.30 p.m.; 5.30, 11.40 a.m.; 3.20 p.m
Behaviour of coal: Easily worked.
Average time between poking: 4 hours
Clinker: Slight tendency.
Tar: No trouble
State of engine valves at end of trial: Needed cleaning.
Valves last cleaned: Nov. 21, 1908

29. **Analysis of Dry Coal.**

Hydrogen	4·5%
Carbon	65·6%
Nitrogen	1·3%
Oxygen	20·1%
Sulphur	0·4%
Total carbon contained by dry coal charged	702·0 lbs.

30. **Analysis of Gas by Volume.**

Carbon dioxide	11·16%
Oxygen	0·62%
Carbon monoxide	15·07%
Hydrogen	13·76%
Methane	3·68%
Ethylene	0·0 %
Nitrogen	55·71%

Remarks.

Coal was easily worked, giving off gas without the use of steam.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1070
32.	Combustible charged during trial	lbs.	975
33.	Average B.H.P. of engine during trial	H.P.	27·53
34.	“ indicated H.P. of engine during trial	H.P.	..
35.	“ H.P. taken by exhauster and gas washer	H.P.	3·25
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	28·55
37.	“ “ corresponding to total gas produced	H.P.	29·60
38.	“ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	26·10

Hourly Quantities.

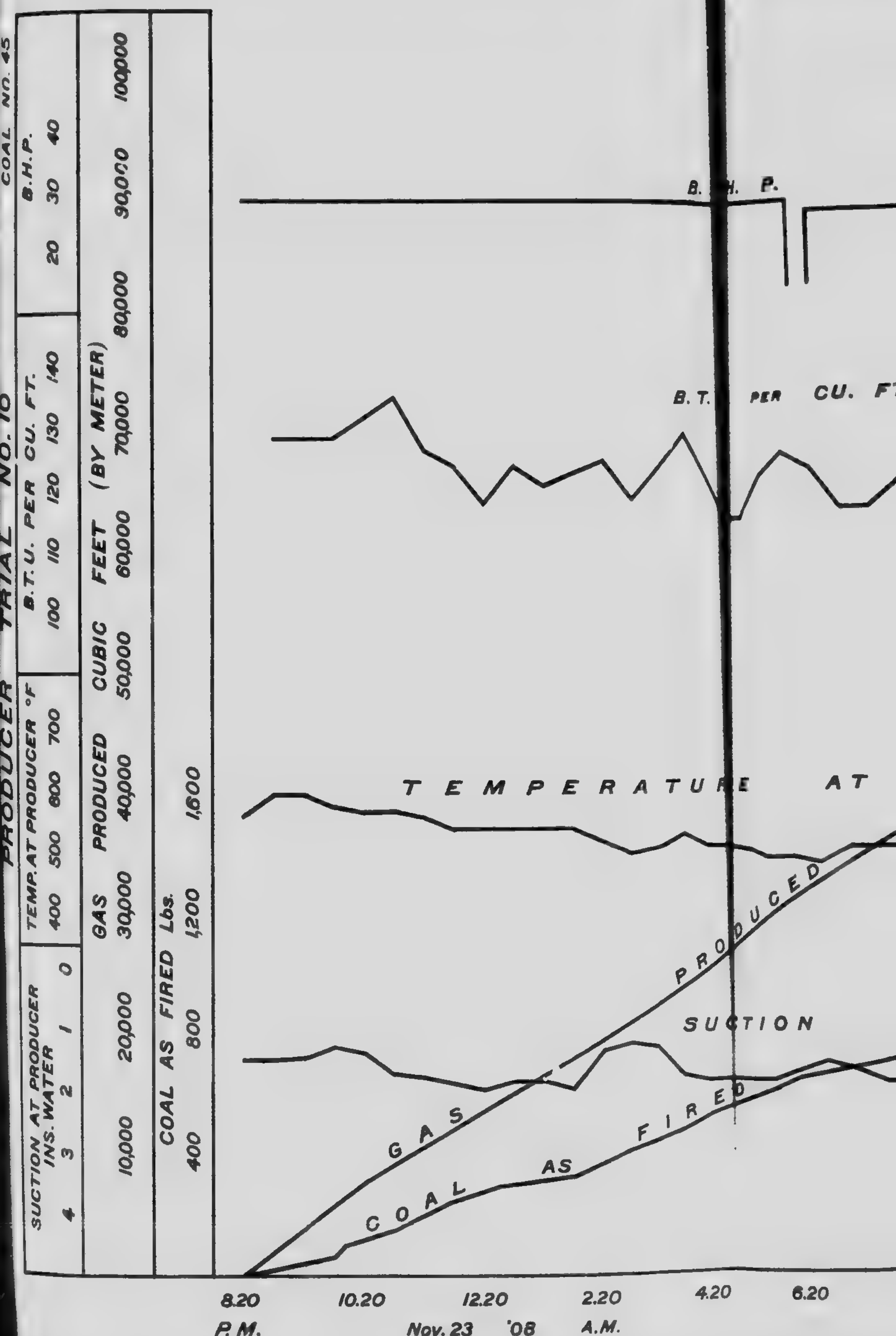
39.	Coal charged per hour	lbs.	63·05
40.	Dry coal charged per hour	lbs.	53·50
41.	Combustible charged per hour	lbs.	48·75
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	15·76
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	13·37
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	12·19
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	7·46
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	0
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3007
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	2890
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	2900
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	2792
51.	Calorific value of coal charged per hour	B.T.U.	606000
52.	“ “ gas produced per hour (lower value)	B.T.U.	343000
53.	Steam used in producer per hour	lbs.	0

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	45·7
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	54·1
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	59·3
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	..
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	97·7
59.	Steam used in producer per lb. coal charged	lbs.	0
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	13·25
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	278·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	56·6
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	49·8
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	
65.	Thermal efficiency of engine, based on B.H.P	per cent.	22·0
66.	Over all efficiency of producer and engine plant	per cent.	12·44
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	11570
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	20470

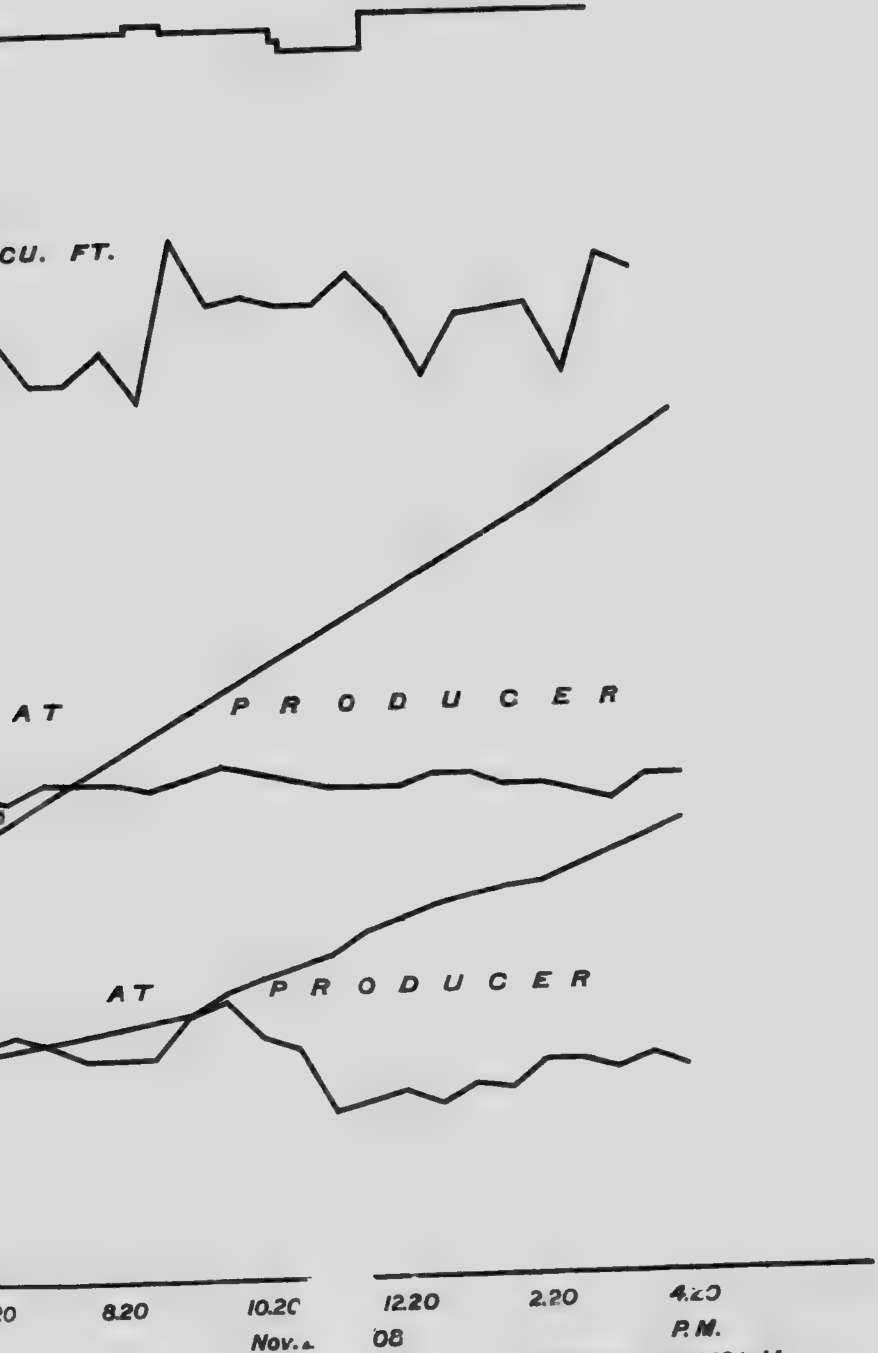
		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·13	1·81	1·65
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·42	2·06	1·87
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·42	2·06	1·87

PRODUCER TRIAL NO. 10 COAL NO. 45



PRODUCER TRIAL NO. 10

COAL NO. 45



APPENDIX III VOL.V

TRIAL OF No. 4 PRODUCER WITH COAL No. 46

Date—November 26 and 27, 1908.

Trial Number—11.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at start of trial	29·47 inches.
" " 9 a.m.	29·79 "
" " 2 p.m.	29·69 "
Water meter at 9 p.m., Nov. 26	30,499 imperial gallons.
" " 2 p.m., " 27	32,223 " "
Difference, in 17 hours	1,724 " "
Brick in producer base	1,020 lbs.
Average level of coal surface below top plate of producer	20 inches.

TIME.	
3.30 p.m., Nov. 26	Fire lighted. Charged 6 lbs. of shavings, 53 lbs. of wood, 192 lbs. of coke.
4.30 " " 27	Charged 124 lbs. of lignite.
5.00 " " 27	" 140 " "
5.30 " " 27	" 71 " "
6.25 " " 27	" 148 " "
7.05 " " 27	" 265 " "
8.00 " " 27	Down-draft with fan exhausting to the atmosphere.
8.15 " " 27	Charged 100 lbs. of lignite.
8.15 " " 27	Down-draft with exhausters.
8.25 " " 27	Engine started.
8.30 " " 27	Trial started.
2.15 " " 27	Trial finished.

This coal worked well in the producer. It only required poking a few times. After running for 12 hours a slight tendency to arch was noticed, and a small amount of clinker was formed, but this did not cause any trouble. No tar was apparent.

Amount of refuse removed from the producer during trial, 420 lbs., after drying.

Amount of refuse removed after trial, 878 lbs., after drying.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—November 26 and 27, 1908. Trial Number—11

Note: R. and B. apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 p.m....	11·2	0·2	0·0	14·2	3·1	14·6	56·7	36·9
10.00 "	11·8	0·3	0·1	14·8	4·0	17·2	51·8	36·1
11.00 "	11·6	0·3	0·0	15·3	3·4	15·4	54·0	34·1
12.00 "	11·6	0·3	0·0	15·6	4·7	16·6	57·2	30·9
1.00 a.m....	9·8	0·5	0·0	17·4	3·5	13·1	55·7	34·0
2.00 "	11·0	0·3	0·0	16·6	2·6	14·1	55·4	33·3
3.00 "	9·3	0·4	0·0	17·1	1·6	15·9	55·7	34·6
4.00 "	10·7	0·3	0·0	16·8	1·0	18·2	55·0	34·0
5 00 " .	12·3	0·5	0·1	14·7	3·7	12·7	56·0	31·2
6 00 "	12·9	0·4	0·0	14·2	3·8	14·0	54·7	32·0
7.00 "	11·3	0·7	0·0	15·5	4·8	12·7	55·0	33·0
8.00 "	12·3	0·4	0·0	14·7	3·6	15·2	55·8	33·5
9.00 "	13·2	0·4	0·0	14·1	3·7	13·5	55·1	31·3
10.00 "	13·7	0·4	0·0	12·4	3·7	14·8	55·0	30·9
11.00 "	12·6	0·4	0·0	13·7	4·2	15·6	55·5	33·5
12.00 "	14·5	0·5	0·0	11·7	4·0	18·0	51·3	33·7
1 10 p.m....	12·7	0·8	0·0	13·2	3·1	17·4	52·0	33·7
2 00 "	13·5	0·4	0·1	13·2	3·2	17·6	52·0	34·1

OBSERVATIONS OF GAS METER AND B.H.P.

Date—November 26 and 27, 1908.

Trial Number—11.

Notes: B.O. indicates that a surplus supply of gas is blowing off into atmosphere. N.B.O. that all the gas is passing to engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
8 30 p.m.	809362							
9 00 "	810662	1300	B.O.	8 30 p.m.	300	120	180	81660
9 30 "	812960	1298	"	....	300	120	180	
10 00 "	814690	1730	"	....	300	120	180	
10 30 "	816440	1750	"	....	300	120	180	
11.00 "	818200	1760	"	....	300	120	180	
11 30 "	819960	1760	"	11 00 p.m.	300	120	180	98260
12 00 a.m.	821730	1670	"	....	300	120	180	
12 30 "	823480	1750	"	....	300	120	180	
1 00 "	825282	1802	"	....	300	120	180	
1 30 "	827050	1768	"	....	300	120	180	
2 00 "	828790	1740	"	1.30 a.m.	325	135	187	14820
2 30 "	830525	1735	"	1.45 "	325	135	187	
3 00 "	832225	1700	"	2 45 "	325	135	187	
3 30 "	833892	1667	"		325	135	187	
4 00 "	835560	1668	"		325	135	187	
4 30 "	837228	1668	"		325	135	187	
5 00 "	838885	1557	"	4 45 "	325	135	187	
6 00 "	842152	3267	"		325	135	187	
6 30 "	843785	1633	"		325	135	187	
7 00 "	845420	1635	"		325	135	187	
7 30 "	846990	1570	"		325	135	187	
8 00 "	848560	1570	"		325	135	187	
8 30 "	850260	1700	"		325	135	187	
9 00 "	851952	1692	"		325	135	187	
9 30 "	853600	1648	"		325	135	187	
10 00 "	855280	1680	"		300	127	173	67478
10 30 "	856840	1560	"		300	127	173	
11 00 "	858464	1424	"		300	127	173	
11 30 "	860090	1426	"		300	127	173	
12 00 p.m	861588	1478	N.B.O		300	127	178	
12 30 "	862990	1402	"		300	127	173	
1 00 "	864585	1595	"		300	127	173	
1 30 "	866310	1725	"		300	127	173	
2 00 "	867680	1370	"		300	127	173	
2 15 "	868380				300	127	173	98730

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—November 26 and 27, 1908. Trial Number—11

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.30 p.m.	65	7/12	9·34	19·71	1900	133·8	8.30 p.m.			
9.00 "	66	7/12	8·83	18·21	1940	123·6				
9.30 "	67	1/2	9·01	18·72	1635	125·8	9.30 "	50	50	
10.00 "	67	1/2	8·14	17·83	1610	123·3				
10.30 "	67	1/2	8·58	18·71	1600	128·3	10.45 "	50	100	
11.00 "	67	7/12	8·90	18·70	1870	124·4	11.00 "	50	150	
11.30 "	68	7/12	9·08	19·14	1865	123·3				
12.00 "	68	7/12	9·11	18·83	1890	124·8	12.00 a.m.	50	200	
12.30 "	69	1/2	9·10	18·20	1635	118·0				
1.00 "	69	1/2	9·38	18·26	1670	117·5	1.00 "	50	250	
1.30 "	69	1/2	9·45	18·62	1690	122·8	1.30 "	50	300	
2.00 "	69	7/12	9·41	18·94	1895	122·7				
2.30 "	69	7/12	9·21	18·31	1905	116·5	2.30 "	50	350	
3.00 "	69	1/2	9·42	18·53	1680	121·2	3.15 "	25	375	
3.30 "	69	1/2	9·40	18·51	1645	118·7	3.40 "	25	400	
4.00 "	69	1/2	9·31	18·29	1640	116·7				
4.30 "	69	1/2	9·50	18·80	1655	122·0	4.30 "	50	450	
5.00 "	70	1/2	9·75	18·63	1660	115·5				
5.30 "	70	1/2	9·74	20·20	1630	135·0	5.20 "	50	500	5.20
6.00 "	70	1/2	9·80	19·62	1608	125·0	5.50 "	50	550	
6.30 "	70	1/2	10·05	19·73	1628	125·0	6.30 "	25	575	
7.00 "	70	1/2	9·92	18·93	1640	116·8	7.00 "	50	625	
7.30 "	70	1/2	9·90	19·61	1620	123·6	7.45 "	50	675	
8.00 "	70	1/2	10·18	19·86	1625	124·7				
8.30 "	71	1/2	9·99	19·19	1615	117·5	8·30 "	100	775	8.30
9.00 "	72	1/2	10·25	20·14	1610	126·0				
9.30 "	70	1/2	9·57	19·29	1605	123·5	9.30 "	75	850	
10.00 "	71	7/12	9·83	19·46	1875	122·8				
10.30 "	72	1/2	9·23	19·48	1610	130·8	10.30 "	75	925	
11.00 "	72	1/2	9·32	19·47	1600	128·7	11.00 "	50	975	
11.30 "	72	7/12	9·28	19·39	1860	127·8				
12.00 "	72	1/2	9·79	19·95	1640	132·0				
12.30 "	72	1/2	9·92	20·50	1600	134·0	12.45 p.m.	100	1075	
1.00 "	73	7/12	10·03	20·31	1840	128·5				
1.30 "	74	1/2	10·21	20·76	1630	130·6				
2.00 "	74	1/2	10.81	21·26	1600	132·5	2.00 "	57	1132	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—November 26 and 27

Trial Number—11.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 30 p.m.	670	65	66	83	5·3	4·0	5·5	7·0	5·0	0·7		
9 00 "	660	67	70	132	5·3	3·5	5·5	7·0	6·1	0·7		
9.30 "	650	68	71	152	5·2	3·5	5·4	6·9	6·1	0·7	48·5	47
10 00 "	630	68	67	132	5·3	3·4	5·5	6·9	6·1	0·7	53	52
10.30 "	620	68	67	130	5·3	3·5	5·7	6·9	5·9	0·8	45	44
11 00 "	620	68	68	133	5.3	3·5	5·6	7·0	5·9	0·8	64·5	63
11.30 "	610	68	69	132	5·3	3·5	5·5	7·0	6·0	0·9	63	62
12.00 a.m.	600	68	69	130	5·3	3·5	5·5	7·0	6·0	0·6	65	64
12 30 "	600	68	69	130	5·3	3·5	5·5	6·9	6·0	0·7	53·5	52·5
1 00 "	600	69	69	132	5·4	3·6	5·6	7·0	6·1	0·8	66·8	65·8
1 30 "	600	69	70	132	5·4	3·6	5·6	6·9	6·0	0·8	69	68
2.00 "	600	69	70	136	5·3	3·5	5·5	6·9	6·0	0·8	55	54
2.30 "	600	69	69	140	5·3	3·5	5·5	6·9	6·0	0·8	57	56
3.00 "	600	69	69	141	5·3	3·5	5·5	6·7	5·8	0·8	48·5	47·5
3.30 "	600	69	69	140	5·3	3·5	5·5	6·6	5·6	0·8	42	41
4 00 "	600	69	69	140	5·3	3·	5·5	6·6	5·6	0·8	38·5	37·5
4 30 "	600	69	69	141	5.3	3·5	5·5	6·5	5·5	0·9	41	40
5.00 "	600	69	69	142	5·3	3·5	5·5	6·5	5·5	0·8	42	41
5.30 "	600	69	69	141	5·3	3·5	5·5	6·5	5·5	0·8	41	40
6 00 "	580	69	70	143	5·0	3·3	5·2	6·7	5·8	1·1	49	48
6.30 "	570	70	71	141	5·1	3·3	5·3	6·6	5·7	1·2	49	48
7 00 "	560	70	71	140	5·1	3·3	5·3	6·6	5·7	1·2	46	45
7 30 "	540	70	70	146	5·0	3·3	5·3	7·0	6·1	1·6	42·5	40
8 00 "	540	70	69	145	5·1	3·3	5·3	7·0	6·2	1·7	61	59
8 30 "	560	70	72	147	5·1	3·3	5·4	7·6	6·3	1·9	67	65
9.00 "	560	71	73	155	5·1	3·5	5·4	6·7	6·2	1·0	59	57·5
9.30 "	560	70	68	155	5·0	3·3	5·3	7·0	6·3	1·2	72	70
10.00 "	560	71	70	156	4·9	3·2	5·1	7·7	6·8	2·0	70	69
10.30 "	550	72	73	155	4·9	3·4	5·1	7·0	5·9	1·5	67	66
11.00 "	540	72	73	153	4.8	3·3	5·1	7·0	6·7	1·5	73	72
11.30 "	540	74	72	153	4·8	3·3	5·1	6·7	6·0	1·0	73	72
12.00 p.m.	510	72	72	149	4·1	3·0	4·4	5·7	5·0	1·0	72	71
12.30 "	520	73	75	155	4·1	3·0	4·4	6·9	5·8	1·6	72	71
1.00 "	540	73	74	161	4·1	3·0	4·3	6·9	6·3	1·3	72	71
1.30 "	520	74	75	165	5·1	3·2	5·3	6·2	5·5	1·1	70	68
2 00 "	510	74	74	144	5·1	3·2	5·3	6·2	5·1	1·1	72	70

PRODUCER TRIAL No. 11.

Date—November 26-27, 1908. Producer No. 4, at McGill University.

Time of lighting up—3.30 p.m. Trial commenced 8.30 p.m. November 26, ended 2.15 p.m. November 27.

Duration of trial—17¾ hours. Kind of fuel—No. 46 coal

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Blizard, Cameron, Killam.

Chemists—Nicolls, Stansfield, Campbell.

SUMMARY OF OBSERVATIONS

Fuel.

1.	Total coal charged during trial	lbs	1132
2.	Moisture in coal as charged	per cent.	16·1
3.	Calorific value of coal as charged, per lb	B.T.U	9010
4.	" " of dry coal per lb	B.T.U	107[illegible]0
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 41·1; volatile matter, 30·9; ash, 11·9 moisture, 16·1	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 27·9; volatile matter, 6·5	Total per cent.	34·4
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	40

Gas.

8.	Total gas produced during trial (from meter readings)	cub. ft.	59018
9.	Average temperature of gas leaving producer	°F.	581
10.	" " " at meter	°F.	70
11.	Average temperature of air in producer house	°F.	70
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	124·3
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	130·2
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	119·0
14.	Average barometric pressure	lbs. sq in.	14·52
15.	" suction at producer	ins. of water	1·02
16.	" suction at exhauster	ins. of water	6·9
17.	" pressure of gas at meter	ins. of water	1·25

Steam, Water, Etc.

18.	Total steam used in producer during trial	lbs.	[illegible]
19.	" water used in scrubber and gas washer	lbs.	22264
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	[illegible]
22.	" " " gas washer	H.P.	[illegible]

Engine.

23.	Total revolutions during trial (from counter)		231140
24.	Average explosions per minute		104·5
25.	Average effective load on brake	lbs.	178·3
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in	67·0

28. **Notes.**

Fire poked at: 5 20, 8.30 a.m

Behaviour of coal: Good working coal for producer

Average time between poking: 8 hours, 52 minutes

Clinker: Slight tendency.

Tar: None

State of engine valves at end of trial: Needed cleaning

Valves last cleaned: Nov. 25, 1908.

29. **Analysis of Dry Coal.**

Hydrogen	4·5%
Carbon	62·9%
Nitrogen	1·3%
Oxygen	19·5%
Sulphur	0·4%
Total carbon contained by dry coal charged	597·5 lbs.

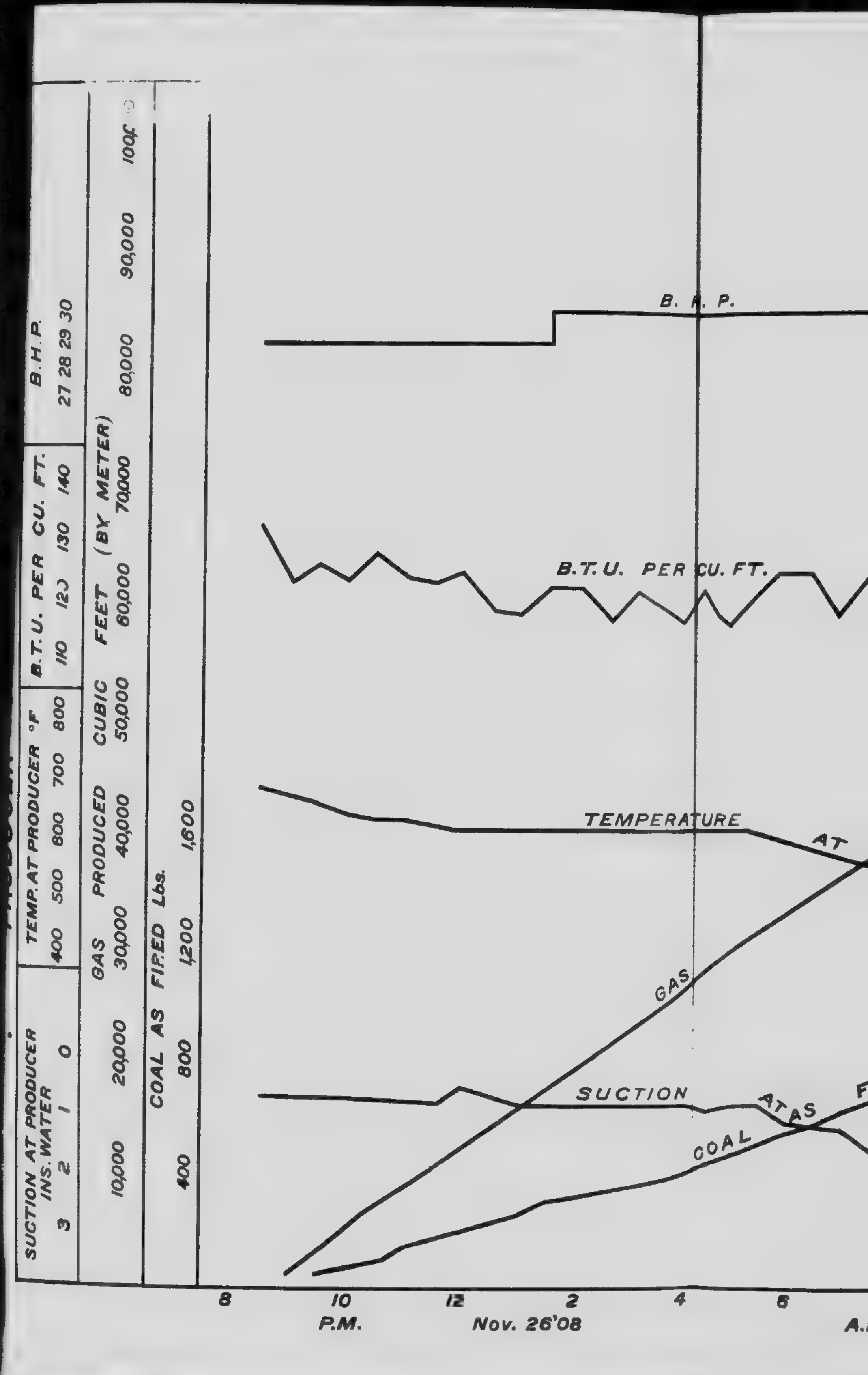
30. **Analysis of Gas by Volume.**

Carbon dioxide	12·00%
Oxygen	0·40%
Carbon monoxide	14·68%
Hydrogen	15·00%
Methane	2·30%
Ethylene	0·2 %
Nitrogen	54·60%

[illegible] NO. [illegible]

COAL NO. [illegible]

[illegible]


SUCTION AT PRODUCER INS. WATER
3 2 1 0
TEMP. AT PRODUCER °F
400 500 600 700 800
B.T.U. PER CU. FT.
110 120 130 140
B.H.P.
27 28 29 30
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600
B. H. P.
B.T.U. PER CU. FT.
TEMPERATURE AT
GAS
SUCTION AT AS
COAL
8
10
12
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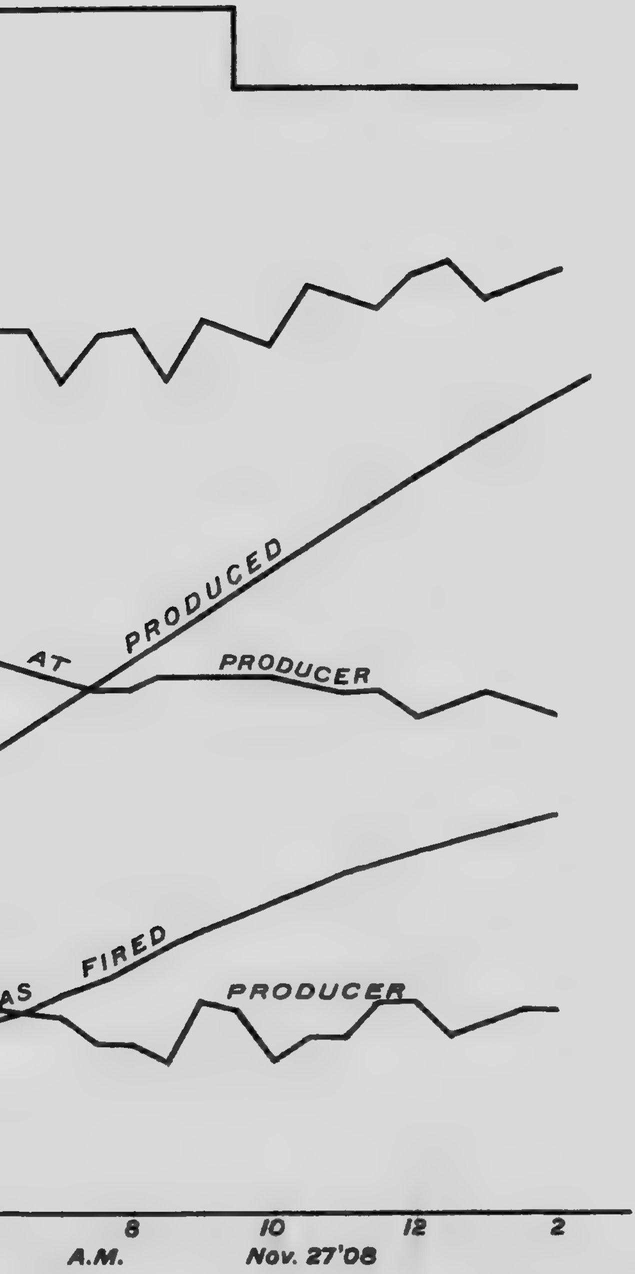
P.M.
Nov. 26'08
A.



APPENDIX III VOL.V

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REMARKS.

This coal is a good working coal for producer work, requiring very little poking, and gave off a very uniform gas; fire had slight tendency to arch.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	950
32.	Combustible charged during trial	lbs.	815
33.	Average B.H.P. of engine during trial	H.P.	29·15
34.	" indicated H.P. of engine during trial	H.P.	40·10
35.	" H.P. taken by exhauster and gas washer	H.P.	3·5
36.	" B.H.P. while gas consumption of engine was taken	H.P.	30·12
37.	" " corresponding to total gas produced	H.P.	34·8
38.	" " " " " " and available for outside use, allowing for power used	H.P.	31·3

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	63·75
40.	Dry coal charged per hour	lbs.	53·5
41.	Combustible charged per hour	lbs.	45·9
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	15·9
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	13·4
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	11·5
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	7·32
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	9·76
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3325
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3175
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	2880
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	2748
51.	Calorific value of coal charged per hour	B.T.U.	574000
52.	" " gas produced per hour (lower value)	B.T.U.	378000
53.	Steam used in producer per hour	lbs.	52·8

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) [illegible]ed per lb. of coal charged	cub. ft.	49·8
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) p[illegible]y coal charged	cub. ft.	59·3
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) p[illegible] per lb. of combustible charged	cub. ft.	69·2
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	68·6
58.	" " " " " " B.H.P. "	cub. ft.	91·2
59.	Steam used in producer per lb. coal charged	lbs.	0·83
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	19·65
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	377·5
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	65·7
63	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	59·0
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	51·2
65.	Thermal efficiency of engine, based on B.H.P	per cent.	23·5
66	Over all efficiency of producer and engine plant	per cent.	15·44
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	10840
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	16490

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·83	1·54	1·32
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·04	1·71	1·46
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·35	1·99	1·69

BELLY RIVER COAL FIELD.

ALBERTA.

TRIAL OF No. 4 PRODUCER WITH COAL No. 43

Date—November 30 and December 1, 1908.

Trial Number—12.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·19 inches.
" " 9 a.m.	29·30 "
" " end of trial	29·53 "
Water meter 8.30 p.m., Nov. 30	32,418 imperial gallons.
" " 7.30 p.m., Dec. 1	34,754 " "
Difference, in 23 hours	2,336 " "
Brick in producer base	1,068 lbs.
Average level of coal surface below top plate of producer	17 inches.

TIME	
3.00 p.m., Nov. 30	Fire lighted, charged 7 lbs. shavings, 41 lbs. wood, and 144 lbs. coke.
4.00 " " "	Charged 314 lbs. of coal.
4.50 " " "	" 134 " "
5.45 " " "	" 319 " "
7.00 " " "	Down-draft with fan exhausting to atmosphere.
7.35 " " "	Charged 120 lbs. of coal.
7.55 " " "	Down-draft with exhauster.
8.05 " " "	Engine started.
8.10 " " "	Charged 60 lbs. of coal.
8.15 " " "	Trial started.
3.15 a.m., Dec. 1	Tendency to form clinker. Some signs of tar from the wet scrubber.
8.15 p.m., " "	Trial finished.

Amount of refuse removed during the trial, from the producer, 440 lbs.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—November 30 and December 1, 1908. Trial Number—1

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
8.30 p.m.	9·6	0·7	0·1	14·0	2·7	14·0	58·8	30·8
9.30 "	8·2	3·4	0·2	13·7	3·3	5·5	63·7	22·7
10.30 "	9·8	0·3	0·1	15·0	3·2	13·8	57·8	32·1
11.30 "	12·0	0·2	0·1	13·7	3·6	14·4	56·0	31·8
12.30 a.m.	11·2	1·4	0·0	13·4	2·6	12·5	58·9	28·5
1.30 "	12·4	1·3	0·0	11·5	2·7	15·3	56·8	29·5
2.30 "	13·3	0·3	0·0	12·5	3·3	14·2	56·4	30·0
3.30 "	10·8	0·2	0·1	13·8	3·8	15·1	56·2	32·8
4.30 "	11·4	0·4	0·0	13·3	2·9	15·2	56·8	31·4
5.30 "	12·2	0·3	0·0	12·7	3·9	15·7	55·2	32·3
6.30 "	12·2	0·4	0·0	13·3	2·7	16·1	55·3	32·1
7.30 "	10·7	2·1	0·0	12·6	2·9	11·8	59·9	27·3
8.30 "	11·8	0·3	0·0	13·3	2·7	17·3	54·6	33·3
9.30 "	13·0	0·5	0·1	9·7	2·8	19·7	54·2	32·3
10.30 "	14·9	0·3	0·1	10·3	2·6	21·3	51·1	33·7
11.30 " . . .	11·9	0·3	0·4	10·3	3·5	19·6	52·0	33·8
12.30 p.m.	12·0	0·5	0·0	12·1	2·8	17·8	54·5	32·7
1.30 "	11·5	0·4	0·0	14·1	2·0	20·5	51·5	36·6
2.30 "	13·0	0·7	0·0	11·8	3·6	17·3	53·6	32·7
3.30 "	11·1	0·3	0·0	13·8	2·8	15·5	56·5	32·1
4.30 "	11·3	0·4	0·2	12·1	3·9	14·6	57·5	30·8
5.30 "	10·[illegible]	0·4	0·0	13·1	3·6	13·3	59·1	30·0
6.45 "	11·7	0·3	0·0	13·3	3·7	11·8	59·2	28·8
7.30 "	10·1	0·3	0·1	13·9	3·0	13·0	59·6	30·0

OBSERVATIONS OF GAS METER AND B.H.P.

Date—November 30 and December 1, 1908.

Trial Number—12.

Notes: B.O. indicates that there was a surplus amount of gas blowing off into atmosphere. N.B.O. that all the gas was passing through engine. Counter for explosions not recording from 8 15 to 4.15 p.m

Time.	Main [illegible] meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
8 15 p.m.	869455	......	......	8 15 p.m.	300	115	185	99802
8 45 "	871155	......	B.O.		300	115	185	
9 15 "	872795		"		300	115	185	
9 45 "	874530		N.B.O.		300	115	185	
10 15 "	876150	1620	B.O.		300	115	185	
10 45 "	877775	1625	"		300	115	185	
11 15 "	879400	1625	"		300	115	185	
11 45 "	881000	1600	"		300	115	185	
12 15 a.m.	882600	1600	"	12.15 a.m.	300	115	185	25991
12 45 "	884240	1640	N.B.O.		300	115	185	
1 15 "	885782	1542	"		300	115	185	
1 45 "	887425	1643	"		300	115	185	
2 15 "	889025	1600	"		300	115	185	
2 45 "	890610	1585	"		300	115	185	
3 15 "	892180	1570	"		300	115	185	
3 45 "	893750	1570	"		300	115	185	
4 15 "	895270	1525	"	4 15 "	300	115	185	
4 45 "	896910	1635	"	4 45 "	300	115	185	
5 15 "	898550	1640	"		300	115	185	
5 45 "	900205	1655	"		300	115	185	
6 15 "	901785	1580	"		300	115	185	
6 45 "	903380	1595	"		300	115	185	
7 15 "	904970	1590	"		300	115	185	
7 45 "	906555	1585	"	7 45 "	300	115	185	
8 15 "	908225	1670	"	8.15 "	300	115	185	
8 45 "	909755	1530	"		300	115	185	
9 15 "	911350	1595	"		300	115	185	
9 45 "	912885	1535	"	9 45 "	300	115	185	
10 15 "	914680	1795	"		300	115	185	
10 45 "	916215	1535	"	10 45 "	300	115	185	94291
11 15 "	918050	1835	B.O.		300	115	185	
11 15 "	919490	1440	N.B.O.		300	115	175	
12 15 p.m.	921150	1660	"	12 15 p.m.	300	115	185	
12 45 "	922725	1575	"		300	115	185	
1 15 "	924310	1585	"		300	115	185	
1 45 "	925980	1670	"		300	115	185	
2 15 "	927620	1640	"	2 15 "	300	115	185	
2 45 "	929380	1760	"		300	115	185	
3 15 "	930860	1480	"		300	115	185	
3 45 "	932455	1595	"		300	115	185	
4 15 "	934125	1670	"		300	115	185	
4 45 "	935670	1545	"		300	115	185	
5 15 "	937210	1540	"	5.15 "	300	115	185	36999
5 45 "	938990	1780	B.O.		300	115	185	
6 15 "	940550	1560	N.B.O.		300	115	185	
6 45 "	942250	1700	"		300	115	185	
7 15 "	943765	1515	"		300	115	185	
7 45 "	945482	1717	"		300	115	185	
8 15 "	947160	1678	"		300	115	185	56463

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—November 30 and December 1, 1908. Trial Number—12.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.15 p.m.	63	$\frac{1}{3}$	9·25	18·68	1837	137·0	8.15 p.m.			
8.45 “	65	$\frac{5}{12}$	8·57	15·62	1765	118·0				
9.15 “	66	$\frac{1}{3}$	8·70	15·13	1905	97·0				
9.45 “	67	$\frac{5}{12}$	8·73	15·66	1987	131·0	9.40 “	50	50	
10.15 “	63	$\frac{1}{3}$	8·86	17·68	1710	119·0	10·05 “	50	100	
10.45 “	63	$\frac{5}{12}$	8·55	16·03	1606	114·0				
11.15 “	64	$\frac{5}{12}$	8·66	16·43	1676	123·5	11.00 “	50	150	
11.45 “	65	$\frac{5}{12}$	9·00	16·22	1730	118·5				11.50 p.m.
12.15 .m.	66	$\frac{5}{12}$	9·03	15·48	1950	119·3	12.00 a.m.	25	175	
12.45 “	[illegible]	$\frac{5}{12}$	9·09	16·39	1855	128·5	12.35 “	50	225	
1.15 “	66	$\frac{5}{12}$	9·26	15·80	1867	112·0	1.20 “	50	275	1.20 a.m.
1.45 “	67	$\frac{5}{12}$	9·25	16·48	1800	123·5				
2.15 “	67	$\frac{5}{12}$	9·11	16·23	1768	119·2				
2.45 “	69	$\frac{5}{12}$	9·05	16·39	1760	122·5	2.35 “	50	325	
3.15 “	69	$\frac{5}{12}$	9·02	16·54	1795	128·0	3.05 “	50	375	3.00 “
3.45 “	70	$\frac{5}{12}$	8·83	15·62	1875	121·0				3.45 “
4.15 “	70	$\frac{5}{12}$	9·02	16·29	1790	123·7	4.00 “	75	450	
4.45 “	70	$\frac{5}{12}$	9·00	15·79	1885	[illegible]	4.45 “	50	500	
5.15 “	70	$\frac{5}{12}$	8·93	15·64	[illegible]	[illegible]	5.20 “	50	550	5.15 “
5.45 “	70	$\frac{5}{12}$	9·05	16·21	1850	125·5				
6.15 “	70	$\frac{5}{12}$	9·00	15·77	1905	122·7	6.60 “	50	600	
6.45 “	70	$\frac{5}{12}$	9·15	15·86	1870	119·3	6.45 “	50	650	6.45 “
7.15 “	70	$\frac{5}{12}$	9·19	16·07	1915	125·0				
7.45 “	71	$\frac{1}{3}$	9·28	15·61	1630	122·8	7.45 “	25	675	
8 15 “	71	$\frac{1}{3}$	9·22	16·00	1600	129·0	8.10 “	50	725	
8.45 “	71	$\frac{5}{12}$	9·00	15·73	1995	127·5	8.40 “	50	775	8.35 “
9.15 “	71	$\frac{5}{12}$	8·98	15·65	2000	126·5	9.30 “	75	850	
9.45 “	71	$\frac{5}{12}$	9·27	15·77	2030	125·3	9.50 “	50	900	9.45 “
10.15 “	71	$\frac{5}{12}$	9·38	16·19	1960	126·7				
10.45 “	71	$\frac{5}{12}$	9·07	15·55	1990	122·3	10.40 “	75	975	
11.15 “	71	$\frac{1}{3}$	9·11	15·33	1780	131·5	11.10 “	50	1025	
11.45 “	70	$\frac{1}{3}$	8·92	14·52	1910	127·0				
12.15 p.m.	70	$\frac{1}{3}$	8·87	14·50	1928	129·0	12.00 p.m.	50	1075	12.00 p.m.
12.45 “	70	$\frac{1}{3}$	8·90	14·32	1960	135·0	12.35 “	50	1125	
1.15 “	71	$\frac{1}{3}$	9·28	14·67	1945	124·5	1 20 “	50	1175	
1.45 “	71	$\frac{1}{3}$	9·40	14·80	1970	126·2				
2 15 “	71	$\frac{5}{12}$	9·45	15·00	2300	121·5				2 25 “
2 45 “	71	$\frac{1}{3}$	9·13	15·17	1825	131·0	2.30 “	100	1275	
3.15 “	70	$\frac{1}{3}$	9·15	15·07	1770	124·0				
3.45 “	70	$\frac{1}{3}$	9·44	14·70	1887	118·0	3.40 “	50	1325	
4.15 “	70	$\frac{1}{3}$	9·03	14·24	2140	132·5	4.00 “	100	1425	
4.45 “	70	$\frac{1}{3}$	9·34	16·37	1735	130·2	4.50 “	50	1475	4.50 “
5.15 “	70	$\frac{1}{3}$	9·18	14·80	1878	125·0				
5.45 “	70	$\frac{1}{3}$	9·52	16·73	1675	143·5	5.45 “	50	1525	
6.15 “	70	$\frac{5}{12}$	9·42	15·90	1870	115·1	6·15 “	50	1575	
6.45 “	70	$\frac{5}{12}$	9·87	15·19	1980	137·5				
7 15 “	70	$\frac{5}{12}$	8·93	14·93	2046	119·0	7.00 “	50	1625	
7.45 “	70	$\frac{1}{3}$	8·85	14·52	1720	115·5	7.40 “	100	1725	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—November 30 and December 1, 1908.

Trial Number 12.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 15 p.m.	530	60	60	145	4·8	3·3	5·0	6·5	5·9	1·6	73·5	70
8 45 "	590	60	65	159	5·1	3·4	5·3	7·2	6·5	1·2	58	55
9 15 "	590	62	66	130	5·1	3·4	5·3	7·1	6·5	1·2	63	60
9 45 "	580	63	67	131	5·0	3·3	5·2	6·5	5·5	0·7	61	58
10 15 "	560	64	67	128	5·1	3·3	5·3	6·4	5·7	0·6	68	65
10 45 "	560	65	67	128	5·1	3·4	5·3	6·8	5·9	0·8	72	69
11.15 "	550	65	65	128	4·9	3·3	5·1	6·4	5·8	0·7	68	65
11 45 "	550	66	67	128	4·9	3·2	5·1	6·4	5·6	0·7	67	64
12 15 a.m.	550	67	69	128	5·0	3·3	5·2	6·8	6·0	0·8	29	25
12.45 "	570	68	70	129	4·7	3·2	4·9	6·4	5·6	0·9	19	12
1 15 "	580	68	70	129	4·7	3·2	4·9	6·5	5·4	0·9	20	17
1 45 "	600	69	70	128	5·0	3·3	5·2	6·9	6·0	1·1	43	40
2 15 "	590	70	71	128	4·8	3·3	5·0	6·7	5·9	1·6	46	43
2 45 "	380	70	71	126	4·8	3·3	5·0	6·7	5·9	1·6	49	46
3 15 "	570	70	71	128	4·7	3·3	4·9	6·8	6·0	1·2	60	57
3 45 "	560	70	71	128	4·7	3·3	4·9	6·8	6·0	1·3	65	63
4 15 "	560	70	71	130	4·5	3·1	4·7	7·1	6·2	1·3	64	61
4 45 "	560	70	71	130	4·5	3·1	4·7	7·4	6·6	1·8	59	56
5 15 "	560	70	71	130	4·6	3·3	4·8	7·5	6·7	1·8	47	44
5 45 "	560	70	71	131	4·8	3·3	5·0	7·1	6·2	1·4	38	35
6 15 "	550	70	71	130	4·6	3·3	4·8	7·2	6·2	1·5	35	32
6.45 "	540	70	71	129	4·7	3·3	4·9	7·0	6·2	1·3	42	39
7 15 "	550	71	71	128	4·8	3·3	5·0	7·0	6·1	1·3	52	49
7 45 "	550	71	71	128	4·6	3·1	4·8	6·9	6·0	1·6	62	58
8 15 "	560	71	70	126	4·7	3·2	4·9	7·1	6·1	1·7	70	66
8 45 "	570	71		130	4·7	3·2	4·9	7·5	6·6	1·8	68	65
9 15 "	550	71	"	130	4·9	3·3	5·1	7·3	6·5	1·6	64	60
9 45 "	590	71	72	172	5·6	3·5	5·8	8·9	8·0	2·0	63	57
10 15 "	570	71	71	137	4·7	3·3	4·9	7·0	6·1	1·2	63	58
10 45 "	570	71	70	136	5·2	3·3	5·4	8·7	8·1	2·0	62	58
11 15 "	550	71	70	135	5·1	3·3	5·3	7·1	6·4	1·2	58	55
11 45 "	540	70	69	133	5·0	3·3	5·2	7·6	6·7	1·5	65	61
12 15 p.m.	550	70	69	132	4·7	3·2	4·9	7·2	6·4	1·9	65	63
12.45 "	540	70	68	131	4·6	3·1	4·8	6·8	6·2	1·5	66	64
1 15 "	560	70	77	138	5·6	3·4	5·8	8·8	8·0	2·1	49	46
1 45 "	530	70	70	143	4·8	3·1	5·0	6·9	6·0	1·7	57	44
2 15 "	540	70	70	143	4·8	3·1	5·0	7·5	6·6	1·7	46	43
2 45 "	550	70	68	145	4·8	3·2	5·0	7·6	6·7	1·8	41	38
3 15 "	540	70	69	143	4·8	3·2	5·0	7·7	7·0	1·9	41	38
3 45 "	540	70	70	143	4·6	3·2	4·8	7·9	7·2	1·8	52	48
4 15 "	550	70	69	146	4·6	3·2	4·8	7·9	7·1	2·0	46	43
4 45 "	530	70	69	147	4·4	3·2	4·6	7·4	6·5	1·9	38	35
5 15 "	550	70	68	145	5·0	3·3	5·2	8·6	7·9	2·0	46	43
5 45 "	530	70	68	145	4·3	3·1	4·5	7·0	6·3	1·7	52	49
6·15 "	540	70	68	143	4·6	3·2	4·8	8·2	7·4	2·1	51	47
6 45 "	560	70	67	141	4·8	3·3	5·0	8·4	7·8	2·0	0	0
7 15 "	530	68	68	134	4·3	3·0	4·5	7·0	6·0	1·5	0	0
7 45 "	550	67	62	139	4·4	3·2	4·7	8·1	7·2	1·6	0	0
8 15 "	560	66		143	4·6	3·3	4·8	8·0	7·3	1·9	0	0

PRODUCER TRIAL No. 2.

Date—November 30 and December 1, 1908. Producer No. 4, at McGill University.

Time of lighting up—3.00 p.m. Trial commenced 8.15 p.m. November 30; ended 8.15 p.m. December 1.

Duration of trial—24 hours. Kind of fuel—No. 43 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Blizard, Cameron, Killam.

Chemists—Campbell, Stansfield, Nicolls.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial	lbs.	1725
2.	Moisture in coal as charged	per cent.	12·6
3.	Calorific value of coal as charged, per lb	B.T.U.	9650
4.	" " of dry coal per lb	B.T.U.	11040
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 44·5; volatile matter, 26·6; ash, 16·3; moisture, 12·6	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 47·7; volatile matter, 5·7	Total per cent.	53·4
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43·5

Gas.

8.	Total gas produced during trial (from meter readings)	cub. ft.	77705
9.	Average temperature of gas leaving producer	°F.	557
10.	" " " at meter	°F.	60
11.	Average temperature of air in producer house	°F.	60
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	124·1
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	131·0
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	120
14.	Average barometric pressure	lbs. sq in.	14·58
15.	" suction at producer	ins. of water	1·5
16.	" suction at exhauster	ins. of water	7·3
17.	" pressure of gas at meter	ins. of water	4·05

Steam, Water, Etc.

18.	Total steam used in producer during trial	lbs.	1800
19.	" water used in scrubber and gas washer	lbs.	30120
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·0

Engine.

23.	Total revolutions during trial (from counter)		[illegible]
24.	Average explosions per minute		100·5
25.	Average effective load on brake	lbs	185
26.	Effective radius of brake wheel	ft.	[illegible]
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	68·7

28. **Notes.**

Fire poked at: 11.50 p.m.; 1.20, 3.00, 3.45, 5.15, 6.45, 8.35, 9.45, 12.00 a.m.; 2.25, 4.50 p.m.
Behaviour of coal: Produced uniform gas and enabled engine to run at constant load
Average time between poking: 2 hours, 11 minutes
Clinker: Slight tendency.
Tar: Some signs of tar from wet scrubber
State of engine valves at end of trial: Needed cleaning.
Valves last cleaned: Nov. 28, 1908.

29. **Analysis of Dry Coal.**

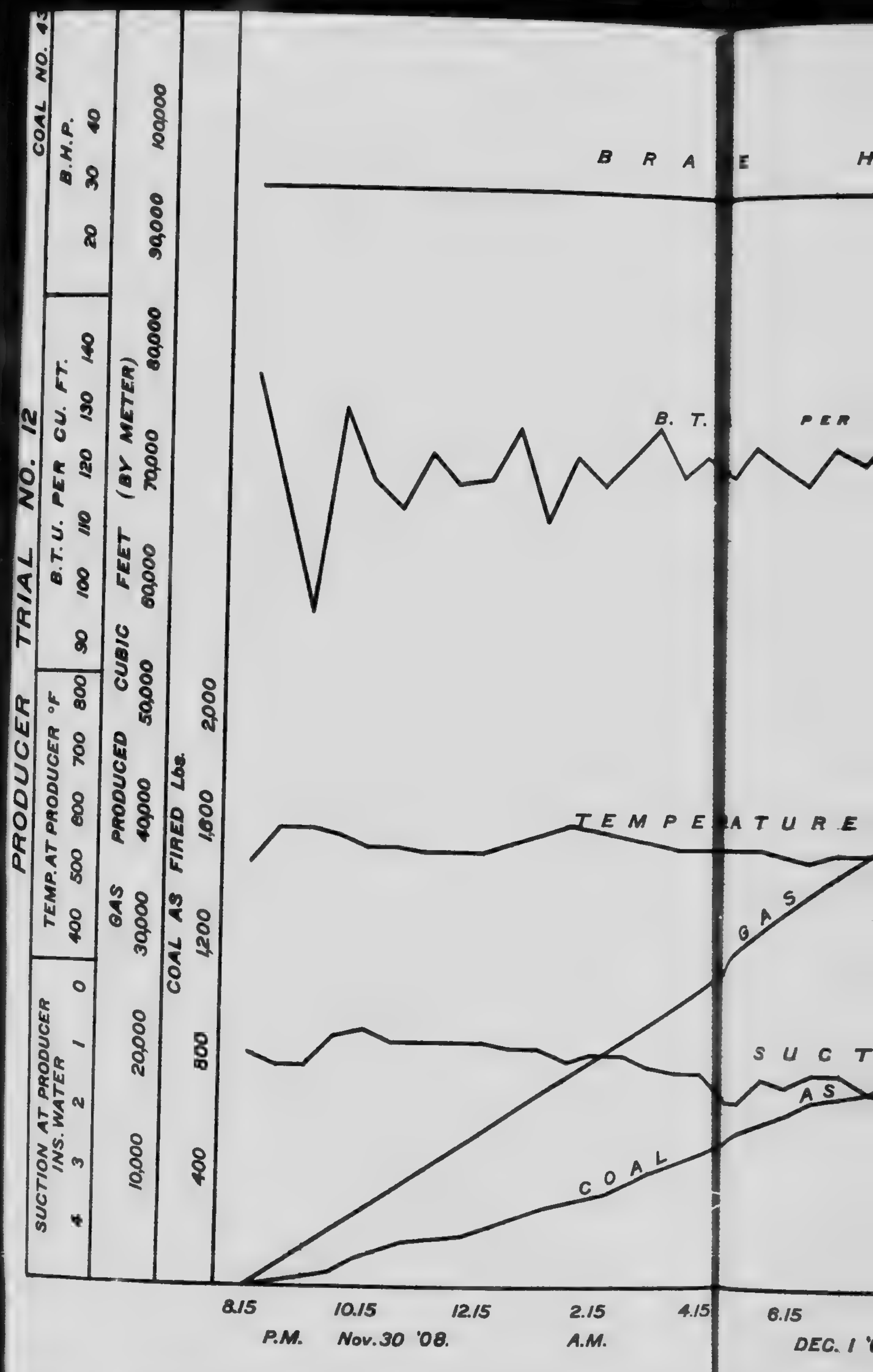
Hydrogen	4·7%
Carbon	64·5%
Nitrogen	1·5%
Oxygen	13·8%
Sulphur	1·4%
Total carbon contained by dry coal charged	973·0 lbs.

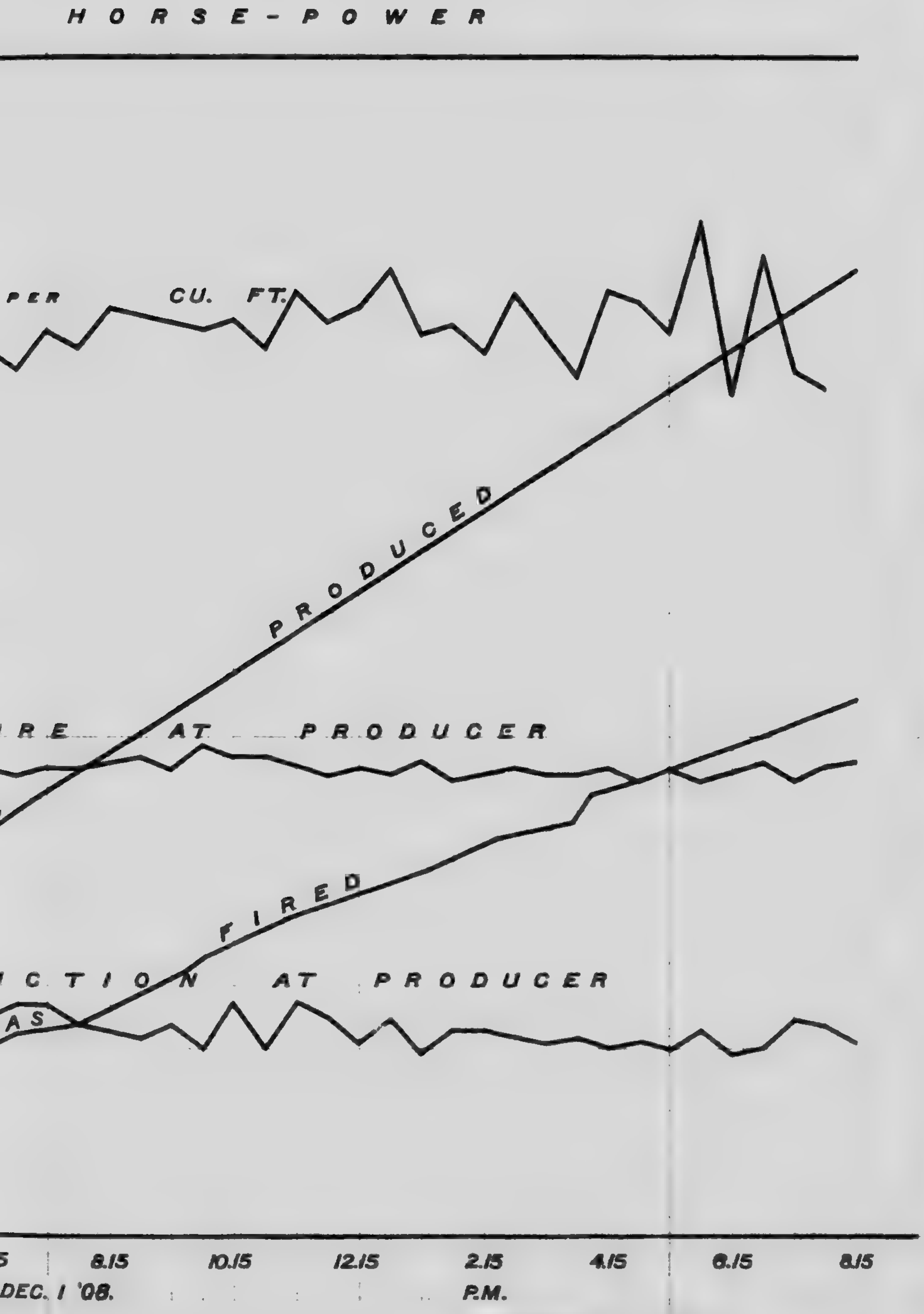
30. **Analysis of Gas by Volum**

Carbon dioxide	[illegible]
Oxygen	0·65%
Carbon monoxide	12·79%
Hydrogen	15·22%
Methane	3·08%
Ethylene	[illegible]
Nitrogen	56·73%

PRODUCER TRIAL NO. 12

COAL NO. 4


PRODUCER TRIAL NO. 12
COAL NO. 43
B.H.P.
20 30 40
B.T.U. PER CU. FT.
90 100 110 120 130 140
TEMP. AT PRODUCER °F
400 500 600 700 800
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600 2,000
B R A E H
B. T. PER
T E M P E R A T U R E
G A S
S U C T
C O A L
A S
8.15 10.15 12.15 2.15 4.15 6.15
P.M. Nov. 30 '08. A.M.
DEC. 1



APPENDIX III VOL.V

REMARKS.

Most of refuse removed during trial could have been fired in producer again. Coal produced a very uniform gas and enabled the engine to run at constant load throughout the whole trial.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	1508
33.	Average B.H.P. of engine during trial	lbs.	1226
34.	" indicated H.P. of engine during trial	H.P.	29·5
35.	" H.P. taken by exhauster and gas washer	H.P.	39·4
36.	" B.H.P. while gas consumption of engine was taken	H.P.	3·5
37.	" " corresponding to total gas produced	H.P.	29·5
38.	" " " " " " " and	H.P.	29·5
	available for outside use, allowing for power used	H.P.	26·0

HOURLY QUANTITIES

39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	71·9
41.	Combustible charged per hour	lbs.	62·8
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	51·1
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	18·0
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	15·7
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	12·8
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	8·47
47.	Gas (by meter) supplied by producer per hour	lbs.	13·0
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per	cub. ft.	3236
	hour		
49.	Gas (by meter) supplied to engine per hour while gas consumption	cub. ft.	3065
	was taken		
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per	cub. ft.	3236
	hour while gas consumption was taken		
51.	Calorific value of coal charged per hour	cub. ft.	3065
52.	" " gas produced per hour (lower value)	B.T.U.	693500
53.	Steam used in producer per hour	B.T.U.	367800
		lbs.	75·0

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal		
	charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	42·6
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of com-	cub. ft.	48·8
	bustible charged		
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	60·0
58.	" " " " " " B.H.P. "	cub. ft.	77·7
59.	Steam used in producer per lb. coal charged	cub. ft.	104·0
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	1·04
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas pro-	lbs.	17·42
	duced		
62.	Efficiency of process of gas production and cleaning, based on coal	lbs.	388·0
	charged		
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	53·4
64.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	46·8
	and for steam used in producer		
65.	Thermal efficiency of engine, based on B.H.P	per cent.	39·6
66.	Over all efficiency of producer and engine plant	per cent.	20·4
67	Calorific value of gas supplied to engine per B.H.P. per hour	per cent.	10·9
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	12480
		B.T.U.	23350

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P.			
	developed by engine			
70.	Pounds per hour charged into producer per B.H.P. avail-	2·42	2·13	1·73
	able for outside use and allowing for power used by			
	auxiliaries			
71.	Pounds per hour charged into producer per B.H.P., allow-	2·76	2·42	1·96
	ing for power and also for steam used by producer	3·26	2·85	2·32

TRIAL OF No. 4 PRODUCER WITH COAL No. 44

Date—December 3 and 4, 1908. Trial Number—13.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	30·00 inches.
" " 8.40 a.m.	29·69 "
" " end of trial	29·44 "
Water meter 9 p.m., Dec. 3	34,950 imperial gallons.
" " 8 p.m., " 4	36,709 " "
Difference, in 23 hours	1,759 " "
Brick in producer base	868 lbs.
Average level of coal surface below top plate of producer	12 inches.

TIME.				
4.00	p.m.,	Dec.	3	Fire lighted. Charged 5 lbs. shavings, 31 lbs. wood, 150 lbs. coke.
4.50	"	"	"	Charged 186 lbs. coal.
5.40	"	"	"	" 186 " "
6.30	"	"	"	" 351 " "
7.55	"	"	"	Down-draft with fan exhausting to the atmosphere.
8.10	"	"	"	Charged 100 lbs. of coal.
8.15	"	"	"	Down-draft with blower.
8.25	"	"	"	Charged 50 lbs. of coal.
8.35	"	"	"	Engine started.
8.40	"	"	"	Started trial.
8.50	"	"	"	Steam turned on.
9.50	"	"	"	Steam turned off.
10.30	"	"	"	Steam turned on.
8.40	p.m.,	"	4	Finished trial.

No tar appeared during this trial, and the coal was easily worked.
Weight of refuse removed from the producer during the trial, 455 lbs., after drying.
Weight of refuse removed after trial, 1,200 lbs., after drying.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—December 3 and 4, 1908.

Trial Number—13.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 p.m.....	8·8	3·0	0·5	10·2	5·1	8·1	64·3	23·9
10.00 "	8·6	0·2	0·3	14·2	4·6	11·2	60·9	30·3
11.00 "	10·4	0·2	0·2	14·3	4·1	11·7	59·1	30·3
12.00 a.m.....	12·6	0·3	0·0	12·7	3·6	14·5	56·3	30·8
1.30 "	8·7	0·1	0·1	15·1	4·3	14·4	57·3	33·9
2.00 "	10·5	0·3	0·0	15·0	4·1	15·6	54·5	34·7
3.00 "	11·0	0·3	0·0	13·5	4·0	16·0	55·2	33·5
4.00 "	10·0	0·5	0·2	13·7	2·5	9·8	63·3	26·2
5.00 "	11·0	0·3	0·0	13·4	4·4	14·3	56·6	32·1
6.00 "	11·6	0·2	0·1	13·2	2·8	15·0	57·1	31·1
7.00 "	11·4	0·1	0·0	12·7	2·6	13·9	58·3	29·2
8.00 "	11·3	0·2	0·1	13·6	4·1	12·9	57·8	30·7
9.00 "	11·1	0·2	0·1	14·3	3·9	16·4	54·0	34·7
10.00 "	11·8	0·2	0·0	12·7	4·5	15·6	55·2	32·8
11.00 "	11·6	0·2	0·0	13 2	3·7	18·9	52·4	35·8
12.00 noon....	11·5	0·2	0·1	13·3	3·3	17·9	53·7	34·6
1.00 p.m.....	11·0	0·2	0·0	13·9	3·6	16·0	55·3	33·5
2.00 "	11·3	0·3	0·0	13·6	3·3	17·7	53·8	34·6
3 00 "	11·6	0·1	0·0	13·4	4·3	16·3	54·3	34·0
4.00 "	11·7	0·4	0·0	13·0	4·0	14·0	56·9	31·0
5.00 "	12·1	0·4	0·2	11·8	4·3	18·3	52·9	34·6
6.00 "	10·6	0·3	0·0	15·5	4·2	14·5	54·9	34·2
7.00 "	10·8	0·4	0·0	14·0	3·7	15·9	55·4	33·6

OBSERVATIONS OF GAS METER AND B. H. P.

Date—December 3 and 4, 1908. Trial Number—13.

Notes: B.O. indicates there is a surplus amount of gas blowing off into atmosphere. N.B.O. indicates tha all the gas is passing through engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.40 p.m. ..	948487	....	B.O.	325	125	200	57155
9.10 “ ..	950870	2383	N.B.O.	300	110	190	60260
9.40 “ ..	952523	1653	“	300	110	190	
10.40 “ ..	955735	3232	“	300	110	190	
11.10 “ ..	957375	1620	“	300	110	190	
11.40 “ ..	958896	1521	“	300	110	190	
12.10 a.m. ..	960650	1754	“	300	110	190	
12 40 “ ..	962355	1705	“	300	110	190	
1.10 “ ..	964090	1735	“	300	110	190	
1.40 “ ..	965780	1690	B.O.	300	110	190	
2.10 “ ..	967390	1610	“	300	110	190	
2.40 “ ..	969025	1635	“	300	110	190	
3.10 “ ..	970465	1440	N.B.O.	300	110	190	
3.40 “ ..	971910	1445	“	300	110	190	
4.10 “ ..	973448	1538	“	300	110	190	
4.40 “ ..	974985	1537	“	300	110	190	
5.10 “ ..	976350	1365	“	300	110	190	
5.40 “ ..	977845	1485	“	300	110	190	
6.10 “ ..	979348	1503	“	300	110	190	
6.40 “ ..	980882	1534	“	300	110	190	
7.10 “ ..	982452	1570	“	300	110	190	25155
7.40 “ ..	983865	1413	“	300	110	190	
8.10 “ ..	985355	1490	“	300	110	190	
8.40 “ ..	986900	1545	“	300	110	190	
9.10 “ ..	988410	1510	“	300	110	190	38290
9.40 “ ..	989735	1325	“	300	110	190	
10.10 “ ..	991275	1540	“	325	130	195	43714
10.40 “ ..	992785	1510	“	325	130	195	
11.10 “ ..	994190	1405	“	325	130	195	
11.40 “ ..	995120	1630	“	325	130	195	54700
12.10 p.m. ..	997200	1480	“	325	130	195	
12.40 “ ..	998740	1540	“	325	130	195	
1.10 “ ..	1000250	1510	“	325	130	195	
1.40 “ ..	1001815	1565	“	325	130	195	
2.10 “ ..	1003325	1510	“	325	130	195	
2.40 “ ..	1004836	1511	“	325	130	195	
3.10 “ ..	1006320	1484	“	325	130	195	
3.40 “ ..	1007948	1628	“	325	130	195	
4.10 “ ..	1009385	1337	“	325	130	195	
4.40 “ ..	1010920	1535	“	325	130	195	
5.10 “ ..	1012415	1495	“	325	130	195	
5.40 “ ..	1013890	1485	“	325	130	195	
6.10 “ ..	1015438	1548	“	325	130	195	
6.40 “ ..	1016690	1252	“	325	130	195	
7.10 “ ..	1018320	1630	“	325	130	195	
7.40 “ ..	1020025	1705	“	325	130	195	
8.10 “ ..	1021650	1625	“	325	130	195	
8 40 “ ..	1023090	1440	“	325	130	195	12809

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—December 3 and 4, 1908.

Trial Number—13.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent. Inlet	Water Temp. Deg. Cent. Outlet	Cubic Centimeters of Water.	B.T.U. per Cubic Foot.
8 40 p.m.	50	5/12	6·89	15·50	1910	156·2
9 10 "	51	1/3	6·37	11·47	1995	121·0
9 55 "	55	7/12	6·84	17·43	1830	132·0
10.15 "	55	1/2	6·78	15·13	1860	121·7
10.40 "	55	5/12	6·81	14·58	1730	127·6
11.10 "	57	5/12	6·39	13·49	1820	122·7
11 40 "	58	5/12	6·55	13·80	1770	122·0
12.10 a.m.	59	5/12	6·58	13·58	1720	114·4
12 40 "	60	5/12	6·54	13·13	1840	115·0
1.10 "	61	1/3	6·76	11·81	1741	104·5
1.40 "	62	1/4	6·80	11·88	1880	140·0
2.10 "	63	5/12	6·86	13·83	2317	139·5
2.40 "	63	7/12	6·99	16·63	1821	119·3
3.10 "	64	7/12	7·12	17·68	1822	130·8
3.40 "	65	1/2	7·02	16·74	1600	123·1
4 10 "	65	1/2	7·20	17·66	1600	132·6
4.40 "	67	1/2	7·52	18·26	1595	135·5
5 10 "	67	1/2	7·31	16·26	1600	113·2
5 40 "	67	1/2	7·26	17·26	1600	126·8
6 10 "	67	1/2	7·49	17·28	1625	126·0
6.40 "	68	1/2	7·48	16·93	1640	123·0
7 10 "	69	1/2	7·53	15·92	1660	110·3
7 40 "	69	1/2	7·62	17·10	1660	124·8
8 10 "	69	1/2	7·62	16·31	1680	115·7
8 40 "	70	1/2	7·78	17·69	1690	132·6
9 10 "	70	1/2	7·91	17·53	1725	131·5
9 40 "	70	1/2	8·08	18·50	1705	141·0
10 10 "	70	1/2	8·35	17·52	1750	127·2
10 40 "	71	1/2	7·96	18·61	1745	147·3
11 10 "	71	1/2	9·92	17·36	1805	134·8
11 40 "	71	1/2	8·07	17·24	1820	132·2
12 10 p.m.	72	1/2	8·25	16·90	1880	129·0
12 40 "	72	5/12	8·39	17·33	1590	135·0
1.10 "	72	5/12	8·25	16·48	1620	126·7
1 40 "	72	5/12	8·79	17·58	1615	134·8
2 10 "	72	5/12	8·95	17·02	1670	127·0
2 40 "	72	5/12	8·88	17·23	1675	132·7
3 10 "	72	5/12	8·48	16·48	1696	129·6
3 40 "	72	5/12	8·57	16·45	1770	132·5
4 10 "	72	5/12	8·67	17·65	1750	149·8
4 40 "	72	5/12	8·65	15·74	1820	122·6
5.10 "	72	5/12	8·71	16·46	1750	129·0
5.40 "	72	5/12	8·54	15·67	1770	120·0
6.10 "	72	5/12	8·95	16·05	1825	123·3
6 40 "	72	5/12	8·95	16·38	1820	128·5
7 10 "	72	5/12	9·07	16·05	1890	124·4
7.40 "	72	5/12	8·90	16·15	1900	131·0
8 10 "	73	5/12	8·90	16·36	1940	137·6

Time	Coal Charged.	Total Coal.	Time of Poking.
	lbs.	lbs.	
			9.15 p.m.
9.40 p.m.	50	50	
10.25 "	50	100	10.25 "
11.35 "	25	125	
12.30 a.m.	50	175	
1.10 "	75	250	1.10 a.m.
2.10 "	50	300	
3.00 "	75	375	
4·00 "	75	450	4 00 "
5.10 "	25	475	
5.35 "	50	525	
6·05 "	25	550	
6.35 "	25	575	
7.05 "	50	625	7.05 "
7.35 "	25	650	
8.30 "	75	725	8.35 "
9.30 "	50	775	9.35 "
10.10 "	50	825	
10.40 "	50	875	
11.10 "	50	925	
11.50 "	50	975	
12.35 p.m.	50	1025	
1.30 "	75	1100	
2.30 "	75	1175	2.30 p.m.
3.30 "	50	1225	
4.10 "	50	1275	4 10 "
4.45 "	50	1325	4.45 "
5.30 "	50	1375	5.35 "
6.25 "	75	1450	
7.25 "	50	1500	6.20 "
8.00 "	50	1550	
			7 50 "

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—December 3 and 4, 1908. Trial Number—13

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.40 p.m.	580	55	47	57	4·5	3·3	4·7	7·2	6·4	1·7		
9.10 "	540	56	51	133	4·5	3·3	4·7	7·1	6·6	2·0	62	60
9.40 "	540	58	58	142	4·5	3·3	4·7	8·0	7·3	2·0	59	56
10.10 "	520	60	60	140	4·5	3·3	4·7	8·0	7·5	2·6	. .	.
10.40 "	500	60	60	137	4·5	3·3	4·7	7·3	6·9	1·2	66	63
11.10 "	500	61	62	136	4·5	3·3	4·7	7·1	6·5	1·2	56	53
11.40 "	490	62	63	136	4·6	3·3	4·9	7·2	6·5	1·4	58	54
12.10 a.m.	500	62	64	136	4·6	3·3	4·9	7·2	6·6	1·6	60	56
12.40 "	500	64	65	128	4·6	3·3	4·9	6·9	6·1	1·0	73	70
1.10 "	500	65	66	128	5·5	3·6	5·7	7·2	6·2	0·7	72	69
1.40 "	500	66	67	130	5·0	3·4	5·2	6·3	5·9	0·7	63	60
2.10 "	500	66	67	131	5·0	3·4	5·2	6·8	6·0	0·7	63	60
2.40 "	500	67	68	129	5·0	3·4	5·2	7·2	6·6	1·1	71	68
3.10 "	480	68	68	129	4·4	3·1	4·6	6·2	5·5	0·8	70	67
3.40 "	480	68	68	130	4·5	3·2	4·7	6·8	6·2	1·1	67	64
4 10 "	620	68	69	130	4·5	3·2	4·7	6·6	5·8	0·7	63	60
4.40 "	600	69	69	130	4·5	3·2	4·7	5·8	5·0	0·6	65	62
5.10 "	600	69	69	128	4·5	3·2	4·7	6·5	5·7	0·7	65	62
5.40 "	600	69	69	129	4·5	3·2	4·7	6·2	5·6	0·7	56	53
6.10 "	600	70	70	129	4·5	3·2	4·7	6·6	5·8	0·7	44	41
6.40 "	600	70	70	129	4·5	3·2	4·7	6·4	5·6	0·6	45	42
7.10 "	600	70	70	128	4·5	3·2	4·7	6·6	5·6	0·6	61	58
7.40 "	600	70	70	132	4·5	3·2	4·7	6·3	5·4	0·6	58	55
8.10 "	600	70	70	133	4·6	3·2	4·7	6·6	6·0	0·6	67	64
8.40 "	600	70	70	131	4·6	3·2	4·7	6·5	5·7	0·6	67	64
9.10 "	590	70	70	136	4·5	3·2	4·7	5·9	5·0	0·5	52	49
9.40 "	630	71	71	134	4·5	3·2	4·7	6·9	6·0	0·6	75	73
10.10 "	630	72	72	136	4·5	3·2	4·7	6·7	6·0	0·5	71	69
10.40 "	610	72	72	140	4·5	3·2	4·7	5·5	4·8	0·5	74	72
11.10 "	590	72	72	142	4·5	3·2	4·7	5·8	5·1	0·5	70	68
11.40 "	600	72	73	143	4·5	3·2	4·8	6·1	5·3	0·5	73	70
12.10 p.m.	600	73	73	142	4·5	3·2	4·7	6·5	5·5	0·6	69	66
12.40 "	600	73	74	144	4·6	3·3	4·8	6·5	5·5	0·6	71	68
1.10 "	590	73	74	143	4·7	3·2	4·9	6·9	5·4	0·9	71	68
1.40 "	600	73	74	148	4·6	3·2	4·9	6·6	5·6	0·9	72	69
2.10 "	600	73	71	152	4·6	3·2	4·9	6·5	5·7	0·9	49	47
2.40 "	600	73	72	144	4·6	3·2	4·8	6·5	5·5	0·9	72	69
3.10 "	580	73	72	148	4·4	3·2	4·6	6·4	5·7	1·0	70	67
3.40 "	590	73	71	143	4·5	3·2	4·7	6·7	5·7	1·1	70	68
4.10 "	600	72	72	147	4·4	3·1	4·6	6·3	5·6	1·2	71	68
4.40 "	600	73	72	146	4·4	3·1	4·7	7·1	6·3	1·3	67	65
5.10 "	600	73	72	143	4·5	3·2	4·7	7·4	6·4	1·6	65	63
5.40 "	590	73	72	144	4·3	3·2	4·5	7·3	6·6	1·6	68	66
6.10 "	580	73	73	144	4·4	3·2	4·6	7·3	6·6	1·6	69	66
6.40 "	580	73	71	147	4·2	3·0	4·5	7·4	6·7	1·9	66	63
7.10 "	600	73	72	149	4·4	3·2	4·6	7·4	7·7	2·1	72	70
7.40 "	600	74	73	147	4·1	3·0	4·3	7·1	6·3	1·0	71	67
8.10 "	620	74	73	143	4·3	3·3	4·6	8·0	7·5	1·2	72	69
8.40 "	600	74	73	148	4·3	3·2	4·5	7·3	6·3	1·1	71	69

PRODUCER TRIAL No. 13.

Date—Dec. 3-4, 1909. Producer No. 4, at McGill University.
Time of lighting up—4.00 p.m. Trial commenced 8.40 p.m. December 3; ended 8.40 p.m. December 4.
Duration of trial—24 hours. Kind of fuel—No. 44 coal.
Observers and staff during trial—Cameron, Killam, Gardner.
Computers—Blizard, Cameron, Killam.
Chemists—Campbell, Nicolls, Stansfield.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial	lbs.	1550
2.	Moisture in coal as charged	per cent.	7·8
3.	Calorific value of coal as charged, per lb	B.T.U.	10800
4.	" " of dry coal per lb	B.T.U.	11710
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 47·6; volatile matter, 35·2; ash, 9·4; moisture, 7·8	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 31·5; volatile matter, 9·1. Total	per cent.	40·6
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	47·8

Gas.

8.	Total gas produced during trial (from meter readings)	cub. ft.	74603
9.	Average temperature of gas leaving producer	°F.	572
10.	" " " at meter	°F.	69
11.	Average temperature of air in producer house	°F.	69
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	128·3
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	134·0
13.	Average lower calorific value of gas per cub. ft. from analysis (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	122·4
14.	Average barometric pressure	lbs. sq in.	14·54
15.	" suction at producer	ins. of water	1·0
16.	" suction at exhauster	ins. of water	6·8
17.	" pressure of gas at meter	ins. of water	3·8

Steam, Water, Etc.

18.	Total steam used in producer during trial	lbs.	1725
19.	" water used in scrubber and gas washer	lbs.	24130
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·0

Engine.

23.	Total revolutions during trial (from counter)		310600
24.	Average explosions per minute		103·3
25.	Average effective load on brake	lbs.	193·0
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	70·08

28. **Notes.**

Fire poked at: 9.15, 10.25 p.m.; 1.10, 4.00, 7.05, 8.35, 9.35 a.m.; 2.30, 4.10, 4.45, 5.30, 6.20, 7.50 p.m.
Behaviour of coal: Very good for producer work, showed slight signs of becoming sticky
Average time between poking: 1 hour, 51 minutes.
Clinker: No record of trouble from clinker.
Tar: Free from.
State of engine valves at end of trial: Needed cleaning.
Valves last cleaned: Dec. 2, 1908.

29. Analysis of Dry Coal.

Hydrogen	4·9%
Carbon	66·5%
Nitrogen	1·7%
Oxygen	15·1%
Sulphur	0·8%
Total carbon contained by dry coal charged	951·0 lbs.

30. Analysis of Gas by Volume.

Carbon dioxide	10·90%
Oxygen	0·42%
Carbon monoxide	13·45%
Hydrogen	14·74%
Methane	3·87%
Ethylene	0·10%
Nitrogen	56·52%

REMARKS.

This fuel required very little attention in the producer, and the gas was of uniform quality.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1430
32.	Combustible charged during trial	lbs.	1282
33.	Average B.H.P. of engine during trial	H.P.	30·4
34.	“ indicated H.P. of engine during trial	H.P.	41·4
35.	“ H.P. taken by exhauster and gas washer	H.P.	3·5
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	30·4
37.	“ “ corresponding to total gas produced	H.P.	30·4
38.	“ “ “ “ “ “ and available for outside use, allowing for power used	H.P.	26·9

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	64·6
40.	Dry coal charged per hour	lbs.	59·6
41.	Combustible charged per hour	lbs.	53·4
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	16·1
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	14·9
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	13·4
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	7·46
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·07
47.	Gas (by meter) supplied by producer per hour	cub. ft.	31·08
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	29·75
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	31·08
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	29·75
51.	Calorific value of coal charged per hour	B.T.U.	698000
52.	“ “ gas produced per hour (lower value)	B.T.U.	364100
53.	Steam used in producer per hour	lbs.	72

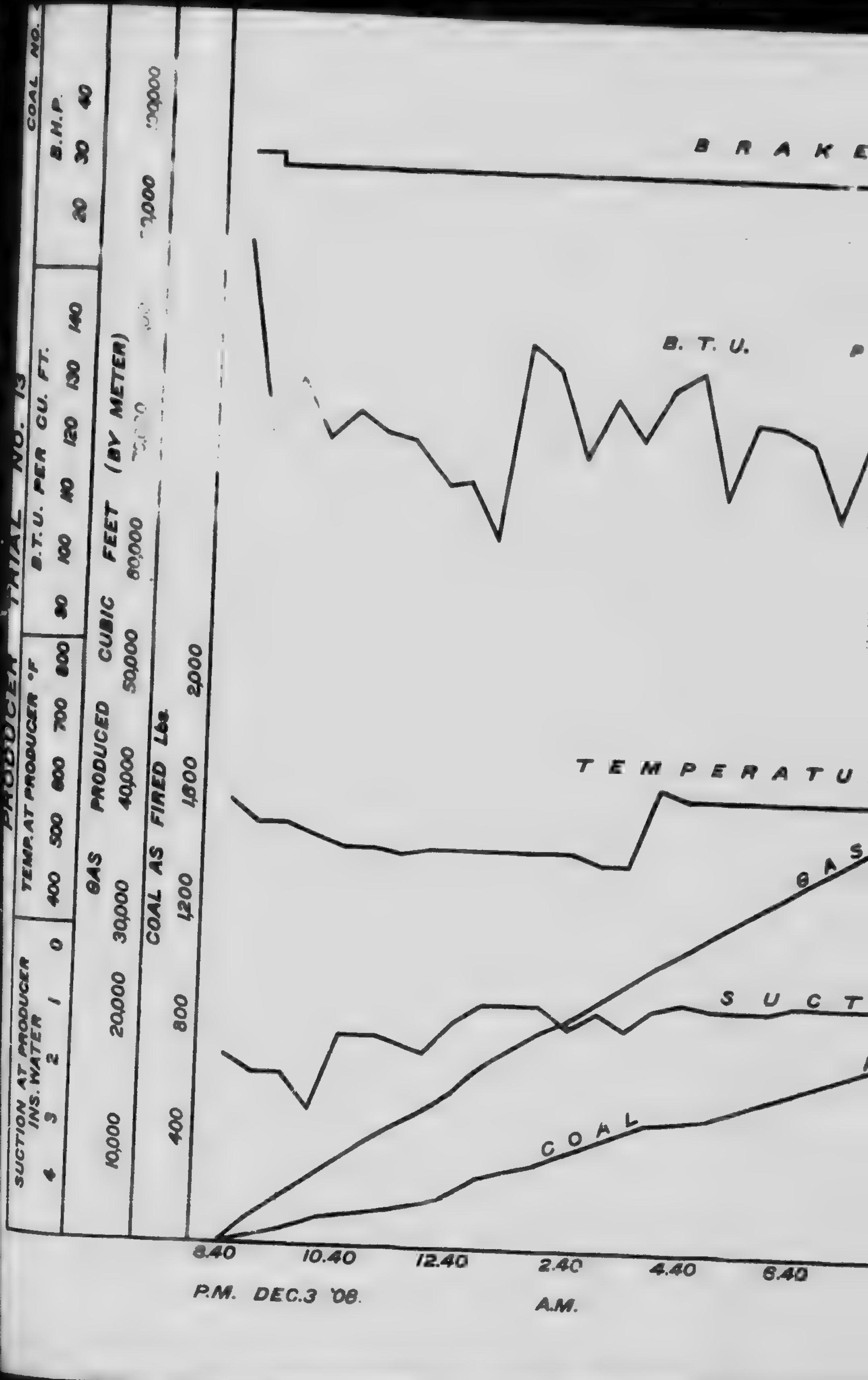
ECONOMIC RESULTS.

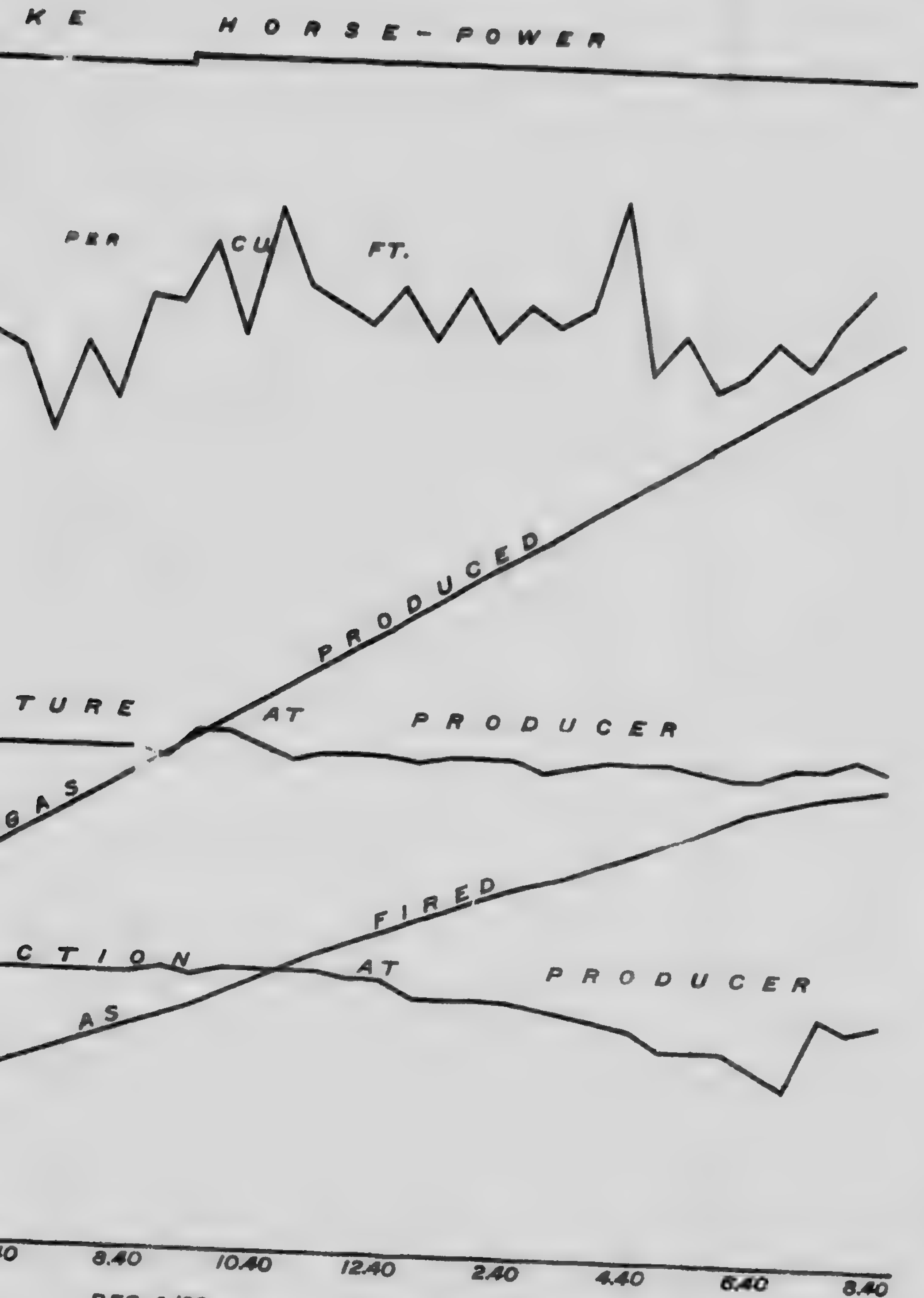
54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	46·0
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	49·9
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	55·7
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	71·8
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	98·0
59.	Steam used in producer per lb. coal charged	lbs.	1·11
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	15·55
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	323·3
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	52·2
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	46·3
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	39·6
65.	Thermal efficiency of engine, based on B.H.P.	per cent.	21·2
66.	Over all efficiency of producer and engine plant	per cent.	11·06
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12000
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	23000

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·13	1·97	1·75
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·40	2·22	1·99
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·81	2·59	2·32

PRODUCER TRIAL NO. 13

COAL NO.


PRODUCER TRIAL NO. 13
COAL NO.
B.H.P. 20 30 40
B.T.U. PER CU. FT. 90 100 110 120 130 140
TEMP. AT PRODUCER °F 400 500 600 700 800
SUCTION AT PRODUCER INS. WATER 4 3 2 1 0
GAS PRODUCED CUBIC FEET (BY METER) 10,000 20,000 30,000 40,000 50,000 60,000 70,000 100,000
COAL AS FIRED Lbs. 400 800 1,200 1,600 2,000
BRAKE
B. T. U.
TEMPERATU
GAS
SUCT
COAL
8.40
10.40
12.40
2.40
4.40
6.40
P.M. DEC.3 '08.
A.M.



APPENDIX III VOL. V

TRIAL OF No. 4 PRODUCER WITH COALS Nos. 2040, 42, 43, 44, 46

OBSERVATIONS OF GENERAL CONDITIONS.

Date—December 15, 1908. FIRST DAY'S RUN. Trial Number—16.

General Notes.

This trial was run on Dec. 15, 16, and 17, during the day only, the producer being banked at night.

Barometer at start of day's run	29·65 inches.
" " 12 a.m.	29·67 "
" " end of day's run	29·69 "
Water meter 8.45 a.m.	45,554 imperial gallons.
" " 5.45 a.m.	46,405 " "
Difference, in 9 hours	851 " "
Brick in producer base	1,057 lbs.
Average level of coal surface below top plate of producer	24·9 inches.

TIME.	
4.30 a.m., Dec. 15	Fire lighted, charged 10 lbs. shavings, 30 lbs. of wood, 130 lbs. of coke.
6 00 " " "	Charged 242 lbs. of coal No. 2040.
7 15 " " "	" 116 " " "
7.45 " " "	" " 75 " " "
7 45 " " "	Down-draft with fan exhausting to the atmosphere.
8.10 " " "	Down-draft with blower.
8.15 " " "	Charged 75 lbs of coal No. 40 A.
8 25 " " "	Started engine.
8 30 " " "	Started trial.
4.35 " " "	Coal 42 being used.
6 30 " " "	Trial finished for the day.

Fire banked with 100 lbs. of coal.
Neither the gas washer nor the sawdust scrubber was used.
85 lbs. of dry refuse removed from the producer during day.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—December 15, 1908. Trial Number—16 (1st day).

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.15 a.m.....	11·3	0·4	0·1	15·7	3·6	13·3	55·6	32·7
11.30 "	11·9	0·4	0·1	16·1	3·0	13·8	54·7	33·0
2.55 p.m.....	12·1	0·6	0·0	15·7	2·7	15·5	53·4	33·9

OBSERVATIONS OF GAS METER AND B.H.P.

Date—December 15, 1908. Trial Number—16 (1st day).

Notes: B.O. indicates that there is a surplus supply of gas blowing off into atmosphere. N.B.O. indicates that all the gas is passing to gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.30 a.m. ..	1184930	....	....	325	133	192	26666
9.00 " ..	1186480	1550	B.O.	325	133	192	......
9.30 " ..	1188070	1590	N.B.O.	325	133	192	
10.00 " ..	1189690	1620	"	325	133	192	
10.30 " ..	1191265	1575	"	325	133	192	
11.00 " ..	1192820	1555	"	325	133	192	
11.30 " ..	1194340	1520	"	325	133	192	
12.00 noon ..	1195860	1520	"	325	133	192	
12.30 p.m. ..	1197360	1500	"	325	133	192	
1.00 " ..	1198950	1590	"	325	133	192	
1.30 " ..	1200600	1650	"	325	135	190	59721
2.00 " ..	1201990	1390	"	325	135	190	
2.30 " ..	1203740	1750	"	325	135	190	
3.00 " ..	1205315	1575	"	325	135	190	
3.30 " ..	1206880	1565	"	325	135	190	
4.00 " ..	1208420	1540	"	325	135	190	
4.30 " ..	1209940	1520	"	325	135	190	
5.00 " ..	1211460	1520	"	325	135	190	
5.30 " ..	1212995	1535	"	325	135	190	
6.00 " ..	1214535	1540	"	325	135	190	......
6.30 " ..	1216670	1535	"	325	135	190	92625

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—December 15, 1908.

Trial Number—16 (1st day).

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
8.30 a.m.	57	$\frac{7}{12}$	9·17	20·25	1675	126·0		lbs.	lbs.	
9.00 "	57	$\frac{7}{12}$	6·15	17·40	1685	128·7	9.15 a.m.	25	25	
9.30 "	57	$\frac{7}{12}$	5·75	16·90	1675	127·0	9.40 "	25	50	
10.00 "	58	$\frac{7}{12}$	5·95	16·88	1700	126·0	10.10 "	25	75	
10.30 "	59	$\frac{7}{12}$	6·1[illegible]	17·30	1685	127·7	10.30 "	25	100	
11.00 "	59	$\frac{7}{12}$	6·18	17·34	1680	127·2	10.45 "	25	125	
11.30 "	59	$\frac{7}{12}$	7·58	18·67	1685	123·4	11.05 "	75	200	
12 noon	59	$\frac{7}{12}$	8·20	18·43	1690	123·1	11.45 "	50	250	
12.30 p.m.	59	$\frac{7}{12}$	8·70	19·66	1695	126·2	12.35 p.m.	50	300	
1.00 "	61	$\frac{7}{12}$	8·12	18·90	1690	123·7	1.15 "	50	350	
1.30 "	61	$\frac{7}{12}$	8·37	19·16	1700	124·6	1.45 "	50	400	1.40 p.m.
2.00 "	61	$\frac{7}{12}$	8·40	18·94	1710	122·5				2.00 "
2.30 "	62	$\frac{7}{12}$	8·59	19·59	1700	127·1	2.30 "	50	450	
3.00 "	62	$\frac{7}{12}$	8·44	19·02	1700	122·1				
3.30 "	60	$\frac{7}{12}$	8·17	18·23	1785	122·0	3.15 "	50	500	
4.00 "	60	$\frac{1}{2}$	8·53	18·32	1615	125·2	4.00 "	50	550	3.55 "
4.30 "	60	$\frac{1}{2}$	8·54	17·60	1665	119·5	4.15 "	15	565	
5.00 "	61	$\frac{7}{12}$	8·72	18·46	1920	127·0	4.35 "	35	600	
5.30 "	61	$\frac{1}{2}$	8·87	18·39	1625	122·5	5.35 "	75	675	
6.00 "	61	$\frac{1}{2}$	9·14	18·97	1600	124·7	6·15 "	50	725	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—December 15, 1908. Trial Number—16 (1st da

Time.	TEMPERATURES. °F.				PRESSURE. Ins. of Water.				SUCTION. Ins. of Water.		STEAM PRESSURE. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.30 a.m	580	59	60	170	5·3	3·5	5·5	4·8	......	0·5	No steam used	No steam used
9.00 "	570	60	61	126	4·3	3·1	4·5	4·4	......	0·4		
9.30 "	600	60	58	141	5·3	3·4	5·5	4·7	......	0·6		
10.00 "	600	61	57	125	5·2	3·3	5·4	4·8	......	0·6		
10.30 "	600	62	62	120	5·3	3·3	5·5	4·7	......	0·7		
11.00 "	590	63	62	124	5·2	3·3	5·4	4·7	......	1·0		
11.30 "	580	62	61	124	5·4	3·3	5·6	4·7	......	0·9		
12.00 noon	560	63	60	125	5·3	3·3	5·5	4·7	......	1·0		
12.30 p.m.	560	64	64	124	4·7	3.2	4·9	4.7	......	1·0		
1.00 "	570	64	63	123	5·2	3·3	5·4	5·4	......	1·4		
1.30 "	570	65	64	128	5·2	3·3	5·4	5·6	......	1·6		
2.00 "	550	65	60	128	4·3	3·1	4·5	5·0	......	1·4		
2.30 "	580	64	62	129	5·5	3·5	5·7	5·8	......	1·7		
3.00 "	560	65	62	128	5·0	3·3	5·2	5·5	......	1·6		
3.30 "	560	64	53	125	5·0	3·3	5·2	5·6	......	1·8		
4.00 "	560	64	59	125	4·8	3·2	5·0	5·6	......	2·0		
4.30 "	560	64	59	126	4·9	3·2	5·1	5·7	......	1·9		
5.00 "	560	64	63	128	4·9	3·2	5·1	5·7	......	2·0		
5.30 "	560	65	62	127	4·9	3·2	5·1	5·9	......	2·1		
6.00 "	560	65	61	128	4·9	3·2	5·1	6·3	......	2·3		
6.30 "	560	65	62	128	4·9	3·1	5·1	6·3	......	2·4		

OBSERVATIONS OF GENERAL CONDITIONS.

Date—December 16, 1908. SECOND DAY'S RUN. Trial Number—16—*Continued*.

General Notes.

Barometer at beginning of day's run	29.90 inches.
" " end of day's run	29.95 "
Water meter at 8.45 a.m	47,562 imperial gallons.
" " " 5.45 a.m.	47,319 " "
Difference, in 9 hours	757 " "

At the beginning of the trial the fire was poked and shaken and 150 lbs. of coal was charged.

TIME.		
8.30	a.m.,	Trial started.
12.00	p.m.,	Coal No. 43 used.
2.30	"	Engine stopped due to a hot bearing.
3 06	"	Engine restarted.
6 30	"	Stopped the engine for the night and banked the producer with 100 lbs. coal.

330 lbs. of dry refuse was removed from the producer during the day.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date December 16, 1908. Trial Number—16 (2nd day).

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 a.m.....	13·3	0·3	0·1	11·7	5·0	15·0	54·6	31·8
10.00 "	12·0	0·2	0·2	14·3	3·7	17·4	52·2	35·6
1.50 p.m.....	10·3	0·4	0·2	15·9	3·2	16·6	53·4	35·9
3.35 "	10·1	0·2	0·1	15·0	3·1	15·3	56·2	33·5

OBSERVATIONS OF GAS METER AND B.H.P.

Date—December 16, 1908. Trial Number—16 (2nd day).

Notes: B.O. indicates that there is a surplus supply of gas blowing off into atmosphere. N.B.O. indicates that all the gas is passing to gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.30 a.m. ..	1217065	....	N.B.O.	325	122	203	
9.00 " ..	1218827	1762	"	325	122	203	95515
9.30 " ..	1220310	1483	"	325	122	203	
10.00 " ..	1221855	1545	"	325	122	203	
10.30 " ..	1223390	1545	"	325	122	203	
11.00 " ..	1225980	1590	"	325	122	203	
11.30 " ..	1226560	1580	"	325	122	203	
12.00 noon ..	1228160	1600	"	325	122	203	
12.30 p.m.	1229700	1660	"	325	122	203	
1.00 " ..	1231260	1560	"	325	122	203	
1.30 " ..	1232860	1600	"	325	122	203	
2.00 " ..	1234490	1630	"	325	122	203	
2.30 " ..	1236060	1570	"	325	122	203	31640
3.00 " ..	1237750	1690	"	325	122	203	31900
3.30 " ..	1239320	1570	"	325	122	203	
4.00 " ..	1240900	1580	"	325	122	203	
4.30 " ..	1242385	1485	"	325	122	203	
5.00 " ..	1244100	1715	"	325	122	203	
5.30 " ..	1245425	1325	"	325	122	203	
6.00 " ..	1247165	1740	"	325	122	203	
6.30 " ..	1248900	1735	Engine stopped at 6.23 p.m.				53080

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—December 16, 1908.

Trial Number—16 (2nd day).

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.30 a.m.	65	7/12	10·14	22·00	1765	142·3	8.30 a.m.			
9.00 "	64	7/12	6·08	17·30	1740	132·5	8.40 "	50	50	
9.30 "	64	7/12	5·60	17·12	1735	136·0	9.15 "	50	100	
10.00 "	64	½	5·86	16·09	1700	137·7				
10.30 "	64	7/12	5·86	14·58	1620	134·2	9.55 "	50	150	
11.00 "	63	7/12	5·95	14·22	1670	131·3	10.30 "	50	200	
11.30 "	63	½	6·09	16·27	1660	134·0	10.50 "	50	250	
12 noon	63	½	6·16	15·68	1770	133·5	11.20 "	50	300	
12.30 p.m.	63	6/12	6·08	14·74	1650	135·8	12.00 p.m.	50	350	
1.00 "	63	5/12	6·07	13·50	1815	128·3	12.25 "	50	400	
1.30 "	64	6/12	6·65	13·72	1950	131·0	1.10 "	75	475	
2.00 "	63	6/12	6·60	13·86	1960	135·2	1.50 "	50	525	
2.30 "	62	½	5·90	12·16	1840	137·0	2.30 "	50	575	
3.00 "	62	½	5·47	12·15	1660	132·0	3.00 "	25	600	
3.30 "	62	½	6·06	13·06	1605	133·6	3.10 "	50	650	
4.00 "	60	½	5·42	11·34	1910	134·3	3.25 "	50	700	
4.30 "	60	½	6·00	12·20	1600	118·0	4.25 "	25	725	
5.00 "	61	½	5·78	13·06	1695	146·7	4.40 "	100	825	
5.30 "	61	½	5·51	11·36	2120	138·7	5.30 "	25	850	
6.00 "	61	½	5·84	10·54	1845	137·5	5.45 "	50	900	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—December 16, 1908. **Trial Number—16 (2nd da**

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outl
8.30 a.m.	420	65	65	94	5·4	3·3	5·6	5·4	....	1·3	....	
9.00 "	480	65	60	121	4.7	3·3	4·9	4·7	......	0·8	....	
9.30 "	500	65	62	110	4·7	3·2	4·9	4·7	....	0·9	..	
10.00 "	520	65	62	122	4·7	3·2	4·9	4·7	....	0·7	...	
10.30 "	540	64	62	122	4·8	3·2	5·0	4·7	....	0·7	...	
11.00 "	540	65	62	122	4·8	3·2	5·0	4·7	......	0·7	....	
11.30 "	560	65	62	120	5·1	3·3	5·2	4·5	......	0·6	..	
12.00 noon	560	65	62	120	5·0	3·3	5·2	4·4	....	0·5	....	
12.30 p.m	560	66	63	120	4·7	3·2	4·9	4·3	....	0·5	.	
1.00 "	560	66	64	121	5·0	3·3	5·2	4·7	......	0·5	...	
1.30 "	560	66	64	123	5·2	3·3	5·4	4·7	....	0·5	...	
2.00 "	560	66	60	123	5·3	3·3	5·5	4·7	....	0·5	...	
2.30 "	560	65	60	119	5·0	3·3	5·2	4·7	......	0·5		
3.00 "	560	62	55	....	5·0	3·1	5·2	5·0	......	0·8	.	
3.30 "	580	62	58	117	5·2	3·4	5·4	4·9	......	0·6	.	
4.00 "	580	62	58	128	5·3	3·3	5·5	4·8	....	0·7		
4.30 "	540	61	60	194	4·4	3·1	4·6	4·5	......	0·5	.	
5.00 "	610	61	58	137	5·4	3·4	5·6	6·0	....	1·5		
5.30 "	560	61	61	124	4·6	3·0	4·8	5·4	....	1·1	.	
6.00 "	610	61	62	128	5·4	3·3	5·6	5·8	...	1·0		
6.30 "	600	61	61	129	5·4	3·3	5·6	5·8	...	1·0		

OBSERVATIONS OF GENERAL CONDITIONS.

Date—December 17, 1908. THIRD DAY'S RUN Trial Number—16—*Continued*

General Notes.

Barometer reading	30.02 inches
Water meter 3.30 p.m.	38,000 imperial gallons.
" " 4.30 p.m.	38,082 " "
Difference, in one hour	82 " "

200 lbs. of coal No. 46 were used for starting.
At starting the fire was poked, shaken down, and some refuse removed.

8.55 a.m. **Trial for the day started.**
4.55 p.m. **Finish of complete trial.**

After the completion of the trial 830 lbs. of dry refuse was removed from the producer.
During the day's run 260 lbs. of dry refuse was removed.
Trouble with explosion counter throughout trial.

OBSERVATIONS OF GAS METER AND B. H. P.

Date—December 17, 1908. **Trial Number—16 (3rd day.)**

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.55 a.m.	1251465			325	128	197	53559
9.25 "	1253000	1535	N.B.O.	325	128	197	
9.55 "	1254495	1495	"	325	128	197	
10.25 "	1256170	1675	"	325	128	197	
10.55 "	1257585	1415	"	325	128	197	
11.25 "	1259045	1460	"	325	128	197	
11.55 "	1260490	1345	"	325	128	197	
12.25 p.m.	1262030	1640	"	325	128	197	
12.55 "	1263510	1480	"	325	135	190	
1.25 "	1265055	1545	"	325	135	190	
1.55 "	1266545	1490	"	325	135	190	
2.25 "	1267870	1325	"	325	135	190	
2.55 "	1269430	1560	"	325	135	190	
3.25 "	1270900	1470	"	325	135	190	
3.55 "	1272560	1660	"	325	135	190	
4.25 "	1273940	1380	"	325	135	190	
4.55 "	1275250	1310	"	325	135	190	06061

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—December 17, 1908. **Trial Number—16 (3rd day.)**

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.55 a.m.	58	$\frac{1}{12}$	11·07	18·13	1910	128·0	9.05 a.m.	50	50	
9.25 "	57	$\frac{1}{8}$	9·65	17·62	1600	101·0	9.35 "	100	150	
9.55 "	58	$\frac{1}{8}$	9·06	19·16	1725	138·0				9.53 a.m.
10.25 "	57	$\frac{1}{12}$	8·36	19·29	1812	134·3	10.20 "	50	200	
10.55 "	56	$\frac{1}{12}$	8·12	19·42	1770	135·9	10.50 "	25	225	
11.25 "	56	$\frac{1}{8}$	7·75	18·79	1630	142·5	11.10 "	100	325	11.05 "
11.55 "	56	$\frac{1}{8}$	8·10	19·16	1600	140·0	11.45 "	50	375	
12.25 p.m.	56	$\frac{1}{12}$	8·16	19·32	1770	136·0				12.30 p.m.
12.55 "	56	$\frac{1}{8}$	7·32	18·76	1550	140·0	12.40 p.m.	100	475	
1.25 "	55	$\frac{1}{8}$	6·25	17·86	1660	146·0	1.20 "	50	525	1.25 "
1.55 "	56	$\frac{1}{8}$	6·27	16·91	1600	135·0				
2.25 "	57	$\frac{1}{8}$	6·68	17·58	1600	138·0	2.20 "	75	600	
2.55 "	56	$\frac{1}{8}$	6·81	17·62	1600	137·0	2.40 "	90	690	
3.25 "	56	$\frac{1}{8}$	6·95	17·55	1600	138·2	3.00 "	50	740	
3.55 "	56	$\frac{1}{12}$	6·96	17·81	1800	132·5				
4.25 "	56	$\frac{1}{12}$	7·27	18·06	1826	133·7				4.25 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—December 17, 1908. Trial Number—16 (3rd day.)

Notes: B. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9 30 a.m.	13·3	0·3	0·2	12·6	4·3	11·4	57·9	28·5
10 40 "	15·3	0·3	0·1	9·9	4·8	15·8	53·6	30·6
3 45 p.m.	11·8	0·5	0·0	16·4	2·7	15·7	52·9	34·8

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—December 17, 1908. Trial Number—16 (3rd day.)

Time.	TEMPERATURES. °F.				PRESSURE. Ins. of Water.				SUCTION. Ins. of Water.		STEAM PRESSURE.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 55 a.m.	500	60	50	130	3·3	5·3	5·3	4·5	......	0·6	No steam used	No steam used
9 25 "	530	60	54	143	3·1	4·8	4·8	4·8	......	1·0		
9 55 "	600	60	57	126	3·4	5·6	5·5	5·4	......	1·2		
10.25 "	610	60	57	128	3·3	5·6	5·6	6·0	......	1·3		
10.55 "	560	59	56	129	3·0	4·2	4·2	4·7	......	0·8		
11.25 "	600	58	54	124	3·3	5·5	5·5	5·9	......	1·4		
11 55 "	550	58	56	129	3·0	4·4	4·4	4·7	......	0·7		
12.25 p.m.	560	58	54	128	3·2	5·3	5·3	5·3	......	1·0		
12 55 "	570	58	54	130	3·2	5·2	5·2	5·5	......	1·1		
1 25 "	580	58	56	130	3·2	5·0	5·0	6·0	......	1·7		
1.55 "	570	58	56	132	3·2	5·0	5·0	6·0	......	1·7		
2.25 "	560	59	56	138	3·1	5·0	5·0	6·5	......	1·8		
2 55 "	570	59	55	137	3·2	5·2	5·2	5·9	......	1·6		
3.25 "	580	59	55	137	3·2	5·2	5·2	5·9	......	1·6		
3 55 "	580	60	56	137	3·3	5·3	3·3	5·0	......	1·7		
4 25 "	570	60	62	133	3·1	4·9	4·9	5·3	......	1·4		
4 55 "	600	62	66	135	3·2	5·4	5·4	6·3	......	1·4		

PRODUCER TRIAL No. 16.

Date—December 15, 16, 17, 1908. Producer No. 4, at McGill University.

Time of lighting up—4.30 a.m. Trial commenced 8.30 a.m. December 15; end 4.55 p.m. December 17.

Duration of trial—28 hours. Kind of fuel—Coal 2040, 42, 43, 44, 46

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam

Chemists—Campbell, Stansfield, Nicolls.

SUMMARY OF OBSERVATIONS

Note.

These figures do not include the coal used for banking and restarting

FUEL

1.	Total coal charged during trial	lbs.	[illegible]
2.	Moisture in coal as charged	per cent.	18·6
3.	Calorific value of coal as charged, per lb	B.T.U.	8900
4.	" " of dry coal per lb	B.T.U.	10900
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 40·8; volatile matter, 31·1; ash, 9·6, moisture, 18·6	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 40·0; volatile matter, 9·0	per cent.	49·0
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	35·1

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	86700
9.	Average temperature of gas leaving producer	°F.	521
10.	" " " at meter	°F.	62
11.	Average temperature of air in producer house	°F.	[illegible]
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	131
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	133·8
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	122·2
14.	Average barometric pressure	lbs. sq in.	14·62
15.	" suction at producer	ins. of water	1·1
16.	" suction at exhauster	ins. of water	5·2
17.	" pressure of gas at meter	ins. of water	4·12

STEAM, WATER, ETC.

8.	Total steam used in producer during trial	lbs.	0
19.	" water used in scrubber and gas washer	lbs.	24450
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	

ENGINE.

23.	Total revolutions during trial (from counter)		577850
24.	Average explosions per minute		101·7
25.	Average effective load on brake	lbs.	184·5
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	74·7

28. **Notes.**

Fire poked at: 1.40, 2.00, 3.55 p.m.; 15th; 9.53, 11.05 a.m.; 12.30, 2.25, 4.25 p.m., 17th.

Refuse removed at: 1.40, 3.55 p.m., 15th; 8.45, 11.00 a.m.; 3.25, 3.55, 4.40, 3.30 p.m., 16th, 11.10 [illegible] 1.20, 2.25, 4.00 p.m., 17th.

Behaviour of coal: Not abnormal.

Average time between poking: 3 hours, 30 minutes.

Clinker: No trouble from clinker recorded.

Tar: Not troublesome

State of engine valves at end of trial: Did not need cleaning.

Valves last cleaned: Dec. 9, 1908.

29 **ANALYSIS OF DRY COAL.**

Hydrogen	4·56%
Carbon	65·0 %
Nitrogen	1·2 %
Oxygen	17·9 %
Sulphur	0·88%
Total carbon contained by dry coal charged	1251·0 lbs

30 **ANALYSIS OF GAS BY VOLUME.**

Carbon dioxide	12·11 %
Oxygen	0·36%
Carbon monoxide	14·38%
Hydrogen	14·98%
Methane	3·61%
Ethylene	0·16%
Nitrogen	54·55%

REMARKS.

Commercial test 2 days, 10 hours, on the 15th and 16th, and 8 [illegible] on the 17th. Fire banked during night. Neither tar washer nor sawdust scrubber was [illegible]. No steam used.

SUMMARY OF RESULTS

TOTAL QUANTITIES

31	Dry coal charged during trial		
32	Combustible charged during trial	lbs	1922
33.	Average B.H.P. of engine during trial	lbs	[illegible]
34	" indicated H.P. of engine during trial	I.P.	[illegible]
35.	" H.P. taken by exhauster and gas washer	H.P.	43·1
36	" B.H.P. while gas consumption of engine was taken	H.P.	[illegible]
37.	" " corresponding to total gas produced	[illegible]	[illegible]
38	" " " " " " and available for outside use, allowing for power used	H.P.	[illegible]
		H.P.	7·77

HOURLY QUANTITIES

39.	Coal charged per hour		
40	Dry coal charged per hour	lbs	84·5
41.	Combustible charged per hour	lbs.	68·7
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	60·7
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	21·1
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	17·2
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	15·2
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	6·97
47.	Gas (by meter) supplied by producer per hour	lbs.	0
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3100
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3050
50	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3100
51.	Calorific value of coal charged per hour	cub. ft.	3650
52.	" " gas produced per hour (lower value)	B.T.U.	752000
53	Steam used in producer per hour	B.T.U.	372500
		lbs.	0

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	36·0
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	44·4
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	50·3
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	70·2
58	" " " " " " B.H.P. "	cub. ft.	100·6
59.	Steam used in producer per lb. coal charged	lbs.	...
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	10·33
61	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	282
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	49·5

63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	45·4
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	...
65.	Thermal efficiency of engine, based on B.H.P.	per cent.	20·7
66.	Over all efficiency of producer and engine plant	per cent.	10·2
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12300
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	24830

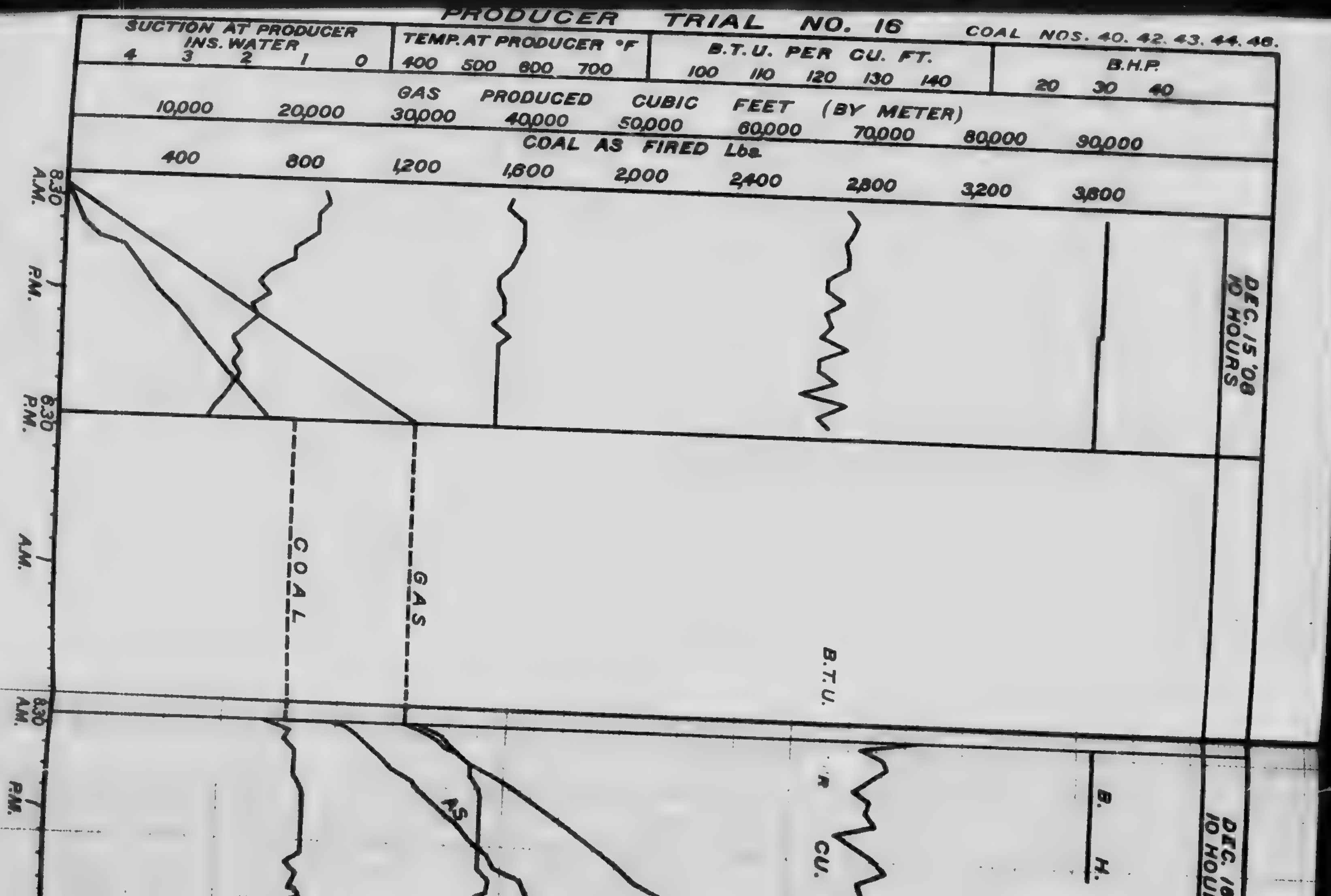
		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·79	2·27	2·01
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	3·04	2·47	2·19
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·04	2·47	2·19

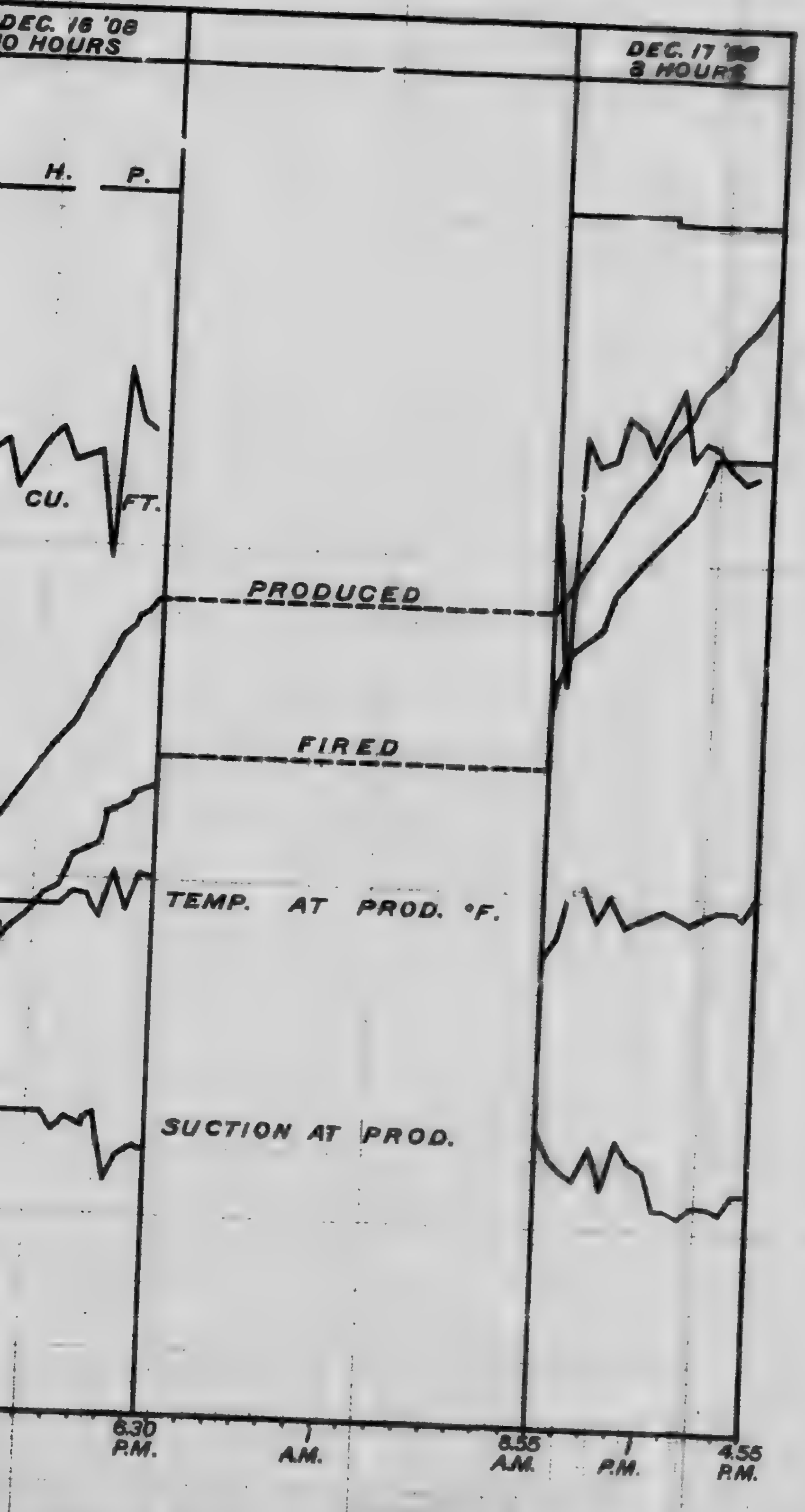
Results, Including the Coal Used for Banking and Re-starting, Are as Follows:—

	Coal used for banking and restarting	lbs.	550
1a.	Total coal used including this amount	lbs.	2915
62a.	Efficiency of process of gas production and cleaning, based on coal charged (1a)	per cent.	40·1
63a.	Efficiency of producer plant, allowing for power used for auxiliaries	per cent.	36·8
66a.	Overall efficiency of producer and engine plant	per cent.	8·3

		Coal as charged.	Dry coal.	Combustible.
69a.	Pounds per hour charged into producer per B.H.P. developed by engine	3·44	2·80	2·47
70a.	Pounds per hour charged into producer per B.H.P. available for outside use, and allowing for power used by auxiliaries	3·75	3·05	2·69

PRODUCER TRIAL NO. 16 COAL NOS. 40. 42. 43. 44. 46.


PRODUCER TRIAL NO. 16
COAL NOS. 40. 42. 43. 44. 46.
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
TEMP. AT PRODUCER °F
400 500 600 700
B.T.U. PER CU. FT.
100 110 120 130 140
B.H.P.
20 30 40
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000
COAL AS FIRED Lbs.
400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600
DEC. 15 '08 10 HOURS
8.30 A.M.
P.M.
6.30 P.M.
A.M.
COAL
GAS
B.T.U.
8.30 A.M.
P.M.
AS
CU.
B. H.
DEC. 16
10 HOU



APPENDIX III VOL.V

EASTERN CROWSNEST PASS.

FRANK-BLAIRMORE COAL FIELD.

ALBERTA

TRIAL OF No. 4 PRODUCER WITH COAL No. 48

Date—December 7 and 8, 1908.

Trial Number—11.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29 22 inches.
" " 10.00 a.m., Dec. 8	29 75 "
" " finish of trial	29·70 "
Water meter at 8.30 p.m., Dec. 7	38,647 imperial gallons
" " " 6.30 p.m., " 8	42,178 " "
Difference, in 22 hours	3,331 " "
Brick in producer base	1,032 lbs.
Average level of coal surface below the top plate of producer	20 inches

TIME.			
3 30	p.m., Dec.	7	Fire lighted, charged 6 lbs. of shavings, 24 lbs. wood, and 132 lbs. coke.
4 45	" "	"	Charged 144 lbs. of coal.
6 15	" "	"	" 173 " "
7.45	" "	"	Down-draft with fan exhausting to the atmosphere.
7 50	" "	"	Down-draft with exhauster.
8 00	" "	"	Started engine.
8 10	" "	8	Started trial.
8 10	" "	"	Finished trial.

The gas washer was shut down at 11.30 p.m., and was cleaned from 2 to 3 a.m.
The sawdust scrubber was used in the interval, during which the gas washer was not running.
The load was removed from the engine for five minutes at 7.20 p.m., the gas holder having dropped too low.
A good deal of difficulty was experienced with this coal, due to clinker, necessitating much shaking and ing. There was also considerable trouble from tar.
Weight of refuse removed from the producer during the trial, 1230 lbs., after drying.
Weight of refuse removed after the trial was 620 lbs., after drying.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—December 7 and 8, 1908. Trial Number—14

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
8.30 p.m.	8·4	0·9	0·1	12·7	3·7	6·[illegible]	67·9	22·8
9.30 "	8·8	0·5	0·3	9·7	4·2	10·4	66·1	24·6
10.30 "	9·0	0·4	0·1	10·1	4·7	9·3	66·4	24·2
11.30 "	8·8	0·4	0·1	10·8	3·6	12·2	64·1	26·7
12.30 a.m.	9·3	0·4	0·0	10·4	4·2	7·4	68·3	22·0
1.30 "	9·5	2·4	0·0	11·[illegible]	3·2	2·1	71·8	16·3
2.30 "	9·6	0·8	0·1	14·4	1·8	7·4	65·9	23·7
3.30 "	6·7	2·6	0·2	11·3	4·5	8·1	66·6	21·1
4.30 "	6·8	2·7	0·0	14·8	2·6	4·4	68·7	21·8
5.30 "	9·9	2·7	0·0	10·3	4·0	6·1	67·0	20·4
6.30 "	7·8	2·8	0·2	9·5	4·0	6·9	68·8	20·6
7.30 "	7·2	3·1	0·2	9·2	5·4	7·2	67·7	22·0
8.50 "	6·6	3·4	0·2	8·7	6·7	10·0	64·4	25·6
10.00 "	9·5	2·5	0·5	6·1	6·0	10·1	65·3	22·
11.00 "	12·7	2·6	0·0	7·6	4·3	8·6	64·2	20·
12.00 p.m.	11·4	2·0	0·2	9·3	4·2	10·6	61·9	24
1.00 "	8·7	2·6	0·2	9·5	4·2	9·6	65·2	23·
2.00 "	9·5	2·0	0·0	14·1	3·2	7·4	63·8	24
3.00 "	11·5	2·2	0·5	6·8	5·1	8·2	65·7	20
4.00 "	9·1	2·2	0·2	9·1	4·7	9·4	65·3	23
5.00 "	8·6	2·3	0·1	8·9	3·1	7·4	69·6	19
6.20 "	7·6	3·2	0·0	9·4	4·0	9·1	66·7	22
7.45 "	8·3	1·9	0·1	12·4	3·9	8·7	64·7	25

OBSERVATIONS OF GAS METER AND B.H.P.

Date—December 7 and 8, 1908.

Trial Number—14.

Notes: B.O. indicates that there is a surplus amount of gas blowing off to the atmosphere. N.B.O. indicates that all the gas is passing to the engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.
	cub. ft.		
8.10 p.m..	1025035		
8.40 "	1026875	1840	N.B.O.
9.10 "	1028705	1830	"
9.40 "	1030515	1810	"
10.10 "	1032330	1815	"
10.40 "	1034230	1900	"
11.10 "	1036095	1865	"
11.40 "	1038010	1915	"
12.10 a.m..	1039675	1665	"
12.40 "	1041490	1815	"
1.10 "	1043045	1555	"
1.40 "	1044792	1747	"
2.10 "	1046435	1643	"
2.40 "	1048035	1600	"
3.10 "	1049890	1855	"
3.40 "	1051370	1480	"
4.10 "	1053340	1970	"
4.40 "	1055155	1815	"
5.10 "	1056935	1780	"
5.40 "	1058600	1665	"
6.10 "	1060375	1775	"
6.40 "	1062155	1780	"
7.10 "	1063760	1605	"
7.40 "	1065635	1875	"
8.10 "	1067555	1920	"
8.40 "	1069310	1755	"
9.10 "	1070710	1400	"
9.40 "	1072240	1530	"
10.10 "	1073655	1415	"
10.40 "	1075420	1765	"
11.10 "	1077185	1765	"
11.40 "	1078955	1770	"
12.10 p.m..	1080650	1695	"
12.40 "	1082310	1660	"
1.10 "	1083990	1680	"
1.40 "	1085685	1695	"
2.10 "	1087415	1730	"
2.40 "	1089155	1740	"
3.10 "	1090740	1585	"
3.40 "	1092355	1615	"
4.10 "	1093900	1545	"
4.40 "	1095355	1455	"
5.10 "	1096980	1625	"
5.40 "	1098780	1800	"
6.10 "	1100460	1680	"
6.40 "	1102040	1580	"
7.10 "	1103700	1660	"
7.40 "	1105295	1595	"
8.10 "	1106875	1580	"

Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	lbs.	lbs.	lbs.	
8 10 p.m..	275	105	170	13370
9.00 "				
9.30 "				
10.55 "	250	95	155	30788
11.55 "	275	105	170	37290
1.40 a.m..				48600
2.25 "	175	60	115	76395
3.10 "	275	110	165	58460
3.46 "				
9.10 "	275	110	165	96420
3.40 p.m..	275	110	165	38906
7.10 "				61855
8.10 "	275	110	165	68444

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—December 7 and 8, 1908. Trial Number— 11

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs	lb.	
8.10 p.m.	55	$\frac{5}{12}$	6·71	13·26	1770	110·0	8.30 p.m.			
8.40 "	57	$\frac{1}{3}$	6·57	11·77	1780	110·0	8 50 "	25	25	
9.10 "	59	$\frac{1}{3}$	7·00	10·82	1930	116·8	. . . . . .			
9.40 "	59	$\frac{1}{3}$	7·03	11·88	1880	122·7	9 35 "	25	50	9 30 p m
10.10 "	60	$\frac{5}{12}$	7·09	12·77	1860	100·5	9 55 "	50	100	. .
10.40 "	61	$\frac{1}{3}$	7·32	12·32	1713	101·8	10.10 "	25	125	. .
11.10 "	60	$\frac{1}{3}$	7·09	11·15	2018	96·5	10.25 "	25	150	
11 40 "	60	$\frac{1}{3}$	7·27	12·78	1670	109·3	10.40 "	25	175	10.40 "
12 10 a.m	61	$\frac{1}{3}$	7·38	12·67	1600	100·07	11.05 "	25	200	11 40 "
12 40 "	62	$\frac{1}{3}$	8·42	13·48	1628	97·8	11.10 "	50	250	. .
1 10 "	63	$\frac{5}{12}$	8·56	14·14	1950	122·0	11.35 "	25	275	. . . .
1.40 "	64	$\frac{5}{12}$	9·77	16·15	1900	115·3	12 05 a.m.	25	300	1.00 a.m
2.10 "	65	$\frac{5}{12}$	11·22	16·70	1895	98·7	12.40 "	50	350	1.35 "
2.40 "	65	$\frac{5}{12}$	11·03	15·99	1945	91·8	2.15 "	50	400	. . . .
3.10 "	65	$\frac{5}{12}$	9·77	16·87	1750	118·0	2.45 "	25	425	.
3.40 "	66	$\frac{5}{12}$	9·52	14·72	1700	108·0	3 05 "	50	475	. .
4.10 "	67	$\frac{1}{3}$	9·32	14·42	1830	111·0	3.30 "	25	500	3.00 "
4 40 "	66	$\frac{1}{3}$	7·52	11·21	2270	99·5	4.00 "	50	550	3.30 "
5.10 "	66	$\frac{1}{3}$	8·03	12·85	1740	99·6	4.15 "	50	600	4.00 "
5 40 "	67	$\frac{1}{4}$	8·35	12·16	1600	96·5	4.55 "	25	625	.
6.10 "	67	$\frac{1}{3}$	8·17	13·83	1600	107·5	5 10 "	25	650	5.35 "
6 40 "	65	$\frac{5}{12}$	6·76	11·89	1850	90·1	5.40 "	25	675	.
7.10 "	65	$\frac{5}{12}$	6·89	13·43	1670	103·8	6.25 "	25	700	6.30 "
7.40 "	66		6·77	12·89	1600	93·0	6.50 "	50	750	7.00 "
8.10 "	66		7·18	13·53	1600	80·5	7.15 "	50	800	. . .
8.40 "	63		7·45	15·24	1680	103·7	8.40 "	50	850	8.40 "
9.10 "	62	$\frac{1}{2}$	6·71	19·71	1650	170·0	9.25 "	50	900	. . . .
9 40 "	63	$\frac{1}{2}$	6·00	13·12	1820	73·3	9.40 "	50	950	
10.10 "	63	$\frac{1}{2}$	6·31	13·73	1850	108·7	10.10 "	75	1025	
10 40 "	62	$\frac{1}{3}$	6 58	12·88	1660	124·3	10.45 "	25	1050	10 45
11 10 "	62	$\frac{5}{12}$	6·89	14·45	1600	115·0	11.20 "	25	1075	11 10
11 40 "	62	$\frac{1}{4}$	6·78	15·18	1790	119·0	11.40 "	50	1125	11 35
12.10 p.m.	62	$\frac{1}{2}$	6·92	14·20	1770	102·0	. . . . . .			12 25 p m
12 40 "	62	$\frac{1}{2}$	6·65	14·16	1796	106·8	12.30 p.m.	75	1200	
1 10 "	61	$\frac{1}{3}$	6·71	14·95	1860	120·6	1.35 "	50	1250	1 35
2.10 "	62	$\frac{1}{3}$	6·85	12·25	1600	102·8	. . . . .			
2 40 "	61	$\frac{5}{12}$	6·82	13·02	1895	111·8	2 35 "	100	1350	2 35
3 10 "	62	$\frac{5}{12}$	6·52	12·25	1890	103·0	3 05 "	50	1400	3 05
3 40 "	62	$\frac{5}{12}$	6·52	13·67	1810	123·0	3 25 "	50	1450	3 20
4.10 "	62	$\frac{5}{12}$	6·18	13·64	1820	129·0	. .	. . . . . .		
4 40 "	62	$\frac{5}{12}$	5·99	13·40	1803	127·0	4 10 "	50	1500	4.10
5 10 "	61	$\frac{1}{3}$	6·21	10·52	1830	93·7	. .		. .	
5.40 "	61	$\frac{1}{4}$	5·83	9·69	1850	113·0	5.10 "	25	1525	5 10
6.10 "	61	$\frac{1}{4}$	6·06	10·14	1680	108·1	5.30 "	25	1550	5 [illegible]
6 40 "	61	$\frac{1}{4}$	6·12	10·06	1810	113·0	5 45 "	25	1575	
7.10 "	60	$\frac{1}{3}$	6·37	11·81	1615	104·4	6.30 "	25	1600	6 [illegible]
7.40 "	60	$\frac{1}{3}$	6·01	11·27	1648	103·0	6.50 "	25	1625	
							7.20 "	25	1650	7 [illegible]
							8 00 "	25	1675	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

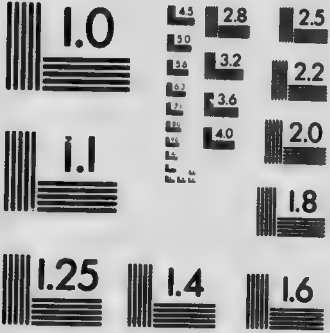
Date—December 7 and 8, 1908.

Trial Number—14.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 10 p.m.	820	59	60	178	3·5	6·3	6·5	9·8	8·8	2·3	67	65
8 40 "	850	60	62	140	3·6	6·3	6·5	9·8	9·2	1·5	73	71
9 10 "	830	62	63	122	3·3	5·5	5·7	8·7	7·7	1·5	69	66
9 40 "	800	63	63	131	3·4	5·6	5·8	10·7	9·5	2·5	73	70
10 10 "	800	64	64	126	3·4	5·7	5·9	10·4	9·2	1·7	72	69
10 40 "	800	64	63	122	3·5	6·0	6·2	12·0	10·8	2·0	71	68
11 10 "	800	65	61	134	3·4	5·7	5·9	11·0	10·0	1·4	67	63
11 40 "	800	64	60	134	3·4	5·6	5·8	9·0		1·9	64	61
12 10 a.m.	780	63	60	137	3·2	5·0	5·2	10·1		2·3	72	69
12 40 "	780	64	62	132	3·3	5·0	5·2	9·5		1·3	70	67
1 10 "	780	64	66	137	3·4	5·5	5·7	10·9		1·9	64	61
1 40 "	780	66	66	129	3·4	5·4	5·6	11·0		1·3	68	65
2 10 "	750	67	67	140	3·3	5·2	5·4	10·8		0·9	61	61
2 40 "	740	68	65	127	3·3	5·4	5·6	10·6		0·7	67	64
3 10 "	720	69	68	130	3·3	4·7	4·9	7·0	6·2	0·7	65	62
3 40 "	700	69	67	133	3·2	5·2	5·4	8·8	7·8	1·6	56	59
4 10 "	750	69	68	132	3·5	6·3	6·5	9·6	8·5	1·3	70	67
4 40 "	740	69	66	139	3·5	6·0	6·2	9·4	8·2	1·6	65	62
5 10 "	730	70	69	142	3·3	5·0	5·2	8·0	6·9	1·5	60	57
5 40 "	730	70	69	140	3·3	5·5	5·7	8·0	6·9	1·6	43	40
6 10 "	740	71	62	140	3·5	6·0	6·2	9·3	8·2	1·8	70	67
6 40 "	720	69	60	140	3·5	5·9	6·1	9·3	8·2	2·1	69	66
7 10 "	720	67	60	138	3·5	6·0	6·2	10·1	9·0	2·1	69	66
7 40 "	720	66	57	139	3·5	6·1	6·3	10·1	8·9	2·0	65	62
8 10 "	720	66	59	136	3·8	6·6	6·8	10·2	8·8	2·0	67	64
8 40 "	690	65	60	146	3·1	4·2	4·4	7·4	7·2	2·0	73	70
9 10 "	690	65	60	142	3·2	4·7	4·9	7·9	7·8	2·0	66	63
9 40 "	690	65	59	139	3·2	4·8	5·0	9·2	8·7	2·6	47	43
10 10 "	700	65	60	150	3·2	4·8	5·0	8·3	8·2	2·5	48	44
10 40 "	750	65	60	144	3·5	6·0	6·2	10·7	9·7	2·7	48	36
11 10 "	780	66	61	141	3·5	5·6	5·8	9·6	8·6	2·1	58	51
11 40 "	800	66	60	153	3·2	5·3	5·5	9·0	8·3	2·5	61	55
12 10 p.m.	750	66	60	147	3·2	5·3	5·5	9·3	8·2	2·1	71	65
12 40 "	750	66	61	152	3·2	5·3	5·5	9·3	8·1	2·4	67	63
1 10 "	730	66	64	150	3·2	5·3	5·5	9·6	8·5	2·7	52	48
1 40	730	66	60	149	3·3	5·5	5·7	9·5	8·6	2·3	64	60
2 10	730	66	60	156	3·4	5·7	5·9	9·1	8·2	1·5	62	58
2 40 "	750	65	59	162	3·2	5·0	5·2	9·[illegible]	8·8	2·5	56	50
3 10 "	770	65	59	146	3·2	5·2	5·4	9·5	8·4	2·4	55	49
3 40 "	730	65	60	178	3·2	5·0	5·2	9·5	8·3	2·9	54	50
4 10 "	700	65	60	146	3·2	5·0	5·2	12·0	10·9	4·7	56	53
4 40 "	700	65	60	140	3·2	5·0	5·2	9·8	8·5	1·8	60	58
5 10 "	680	64	58	138	3·4	5·6	5·8	8·9	8·0	1·3	70	67
5 40 "	700	64	58	139	3·4	5·2	5·4	10·4	9·3	2·7	71	68
6 10 "	700	64	59	143	3·4	5·1	5·3	10·8	9·6	3·0	63	59
6 40 "	700	64	58	126	3·4	5·1	5·3	12·3	11·2	5·0	63	60
7 10 "	700	64	58	138	3·4	5·2	5·4	12·0	10·8	2·4	58	55
7 40 "	710	63	59	142	3·[illegible]	5·1	5·3	12·1	10·8	1·9	60	57
8 10 "	700	63		147	3·5	5·9	6·1	10·4	9·3	1·1	58	55

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

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PRODUCER TRIAL No. 14.

Date—December 7 and 8, 1908. Producer No. 4, at McGill University.

Time of lighting up—3.30 p.m. Trial commenced 8.10 p.m. December 7; ended 8.10 p.m. December 8.

Duration of trial—24 hours. Kind of fuel—No. 48 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Killam, Cameron.

Chemists—Stansfield, Nicolls, Campbell.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1675
2.	Moisture in coal as charged	per cent.	1·0
3.	Calorific value of coal as charged, per lb	B.T.U.	12120
4.	" " of dry coal per lb	B.T.U.	12240
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 51·1; volatile matter, 29·2; ash, 18·7; moisture, 1·0	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 50·8; volatile matter, 3·3 Total	per cent.	54·1
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	40

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	81840
9.	Average temperature of gas leaving producer	°F.	743
10.	" " " at meter	°F.	65
11.	Average temperature of air in producer house	°F.	62
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	108
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	112·2
13b.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	103·9
14.	Average barometric pressure	lbs. sq in.	14·48
15.	" suction at producer	ins. of water	2·0
16.	" suction at exhauster	ins. of water	9·8
17.	" pressure of gas at meter	ins. of water	4·4

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2040
19.	" water used in scrubber and gas washer	lbs.	44260
20.	" tar extracted in scrubber and gas washer	lbs.	26·0
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·0

ENGINE.

23.	Total revolutions during trial (from counter)		310,000
24.	Average explosions per minute		102·1
25.	Average effective load on brake	lbs.	165·0
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	66·96

28. **Notes.**

Fire poked at: 9.30, 10.40, 11.40 p.m.; 1.10, 1.35, 3.00, 3.30, 4.40, 5.35, 6.30, 7.00, 8.40, 10.45, 11.10, 11.35 a.m.; 12.25, 1.35, 2.35, 3.05, 3.20, 4.10, 5.10, 5.40, 6.30, 7.20 p.m.

Behaviour of coal: Not easily worked.

Average time between poking: 58 minutes.

Clinker: Tendency to clinker.

Tar: 26 lbs.

State of engine valves at end of trial: Coated by tar.

Valves last cleaned: Dec. 5, 1908.

29. ANALYSIS OF DRY COAL.

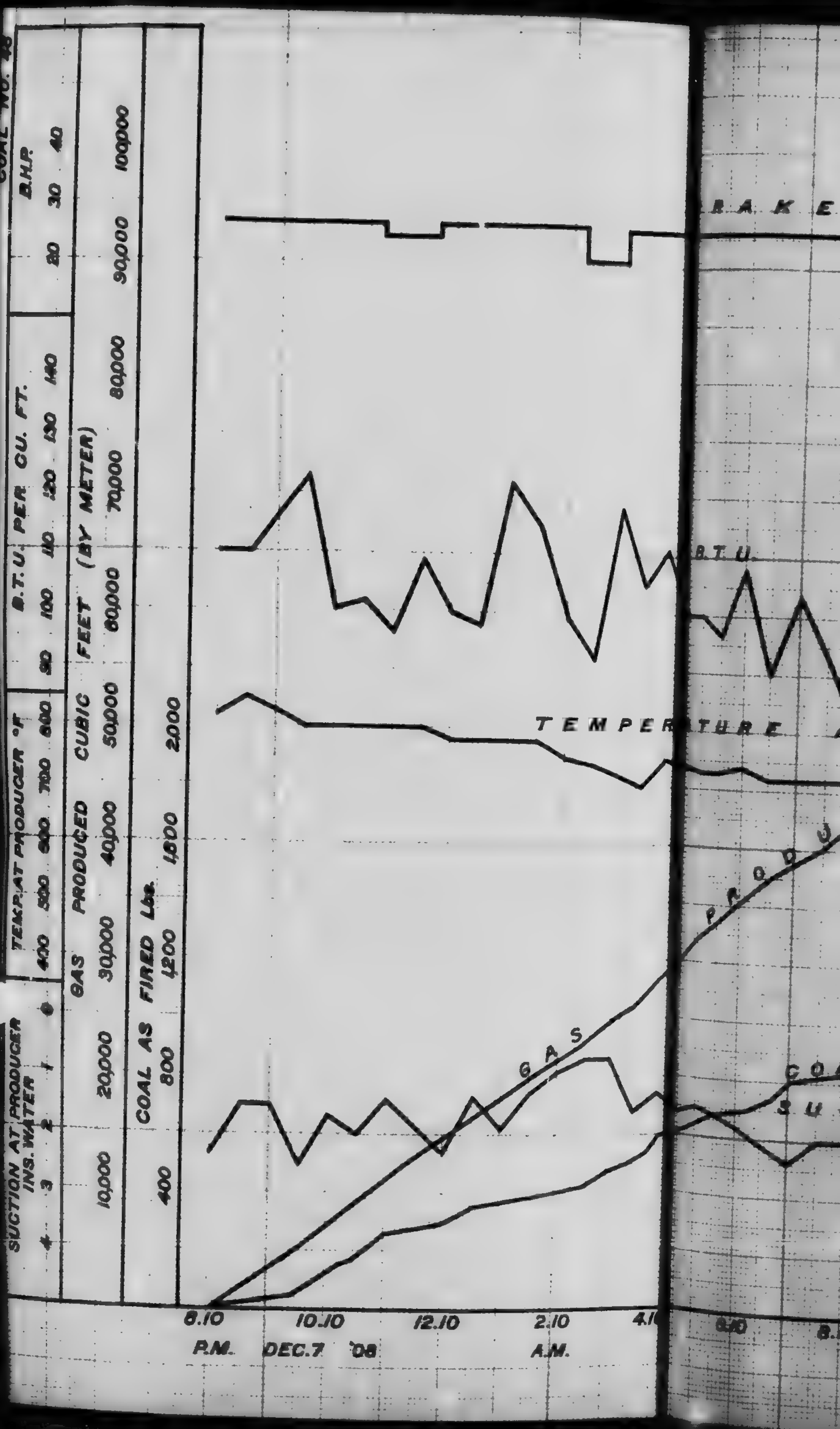
Hydrogen	4·4%
Carbon	70·0%
Nitrogen	1·0%
Oxygen	6·1%
Sulphur	0·6%
Total carbon contained by dry coal charged	1178·0 lbs.

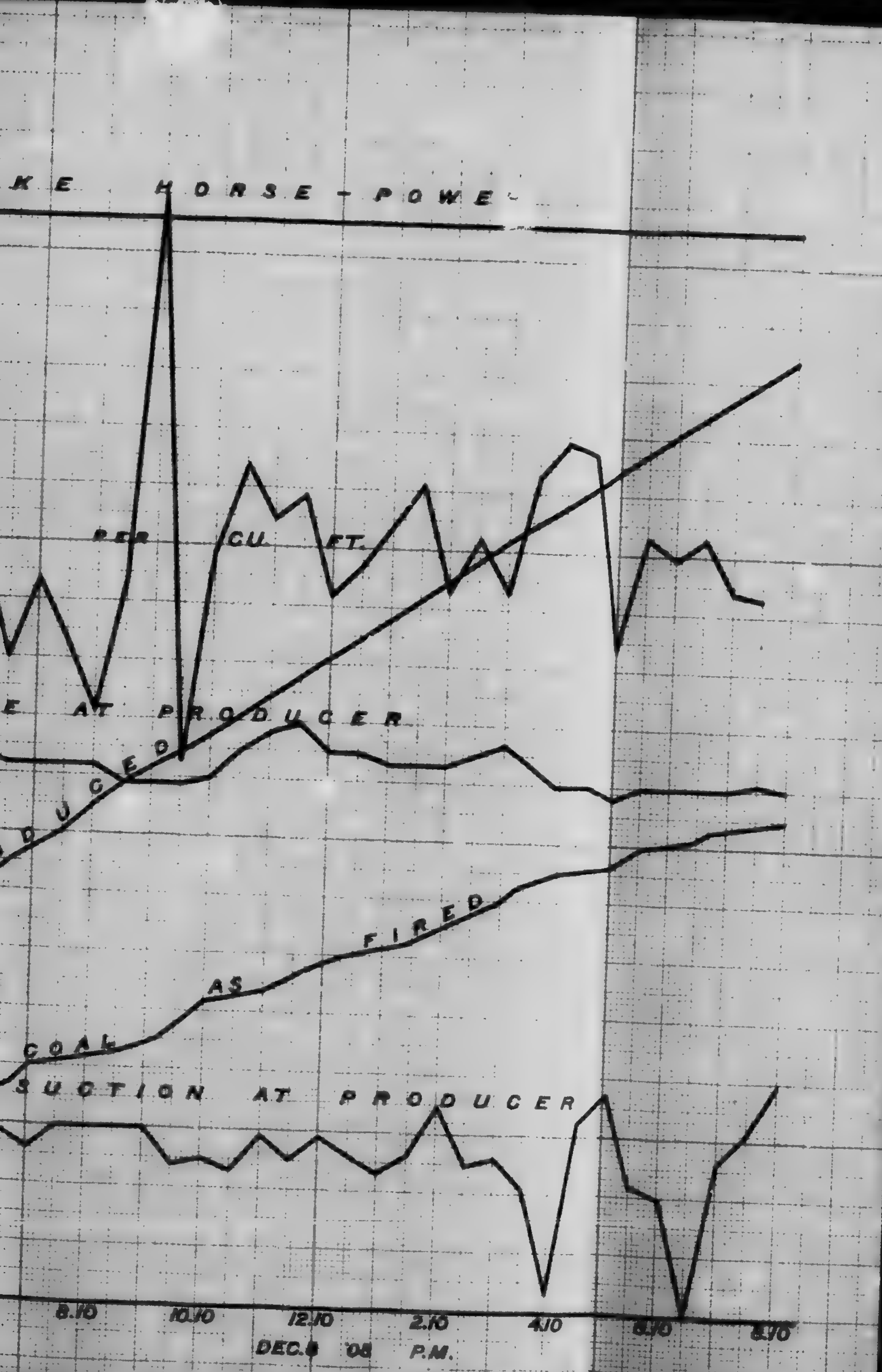
30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	8·9%
Oxygen	2·0%
Carbon monoxide	10·3%
Hydrogen	8·0%
Methane	4·1%
Ethylene	0·1%
Nitrogen	66·6%

PRODUCER TRIAL NO. 14

COAL NO. 45


COAL NO. 18
B.H.P.
20
30
40
B.T.U. PER CU. FT.
90
100
110
120
130
140
TEMP. AT PRODUCER °F
400
500
600
700
800
SUCTION AT PRODUCER INS. WATER
0
1
2
3
4
GAS PRODUCED CUBIC FEET (BY METER)
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
COAL AS FIRED Lbs.
400
800
1200
1600
2000
BRAKE
B.T.U.
TEMPERATURE
PRODUC
GAS
COA
SU
8.10
10.10
12.10
2.10
4.1
6.10
8.
P.M.
DEC. 7 '08
A.M.



APPENDIX III VOL. V

REMARKS.

This coal is not easily worked in producer; it tends to clinker and cake on top, and required much shaking and poking to get sufficient gas to run the engine. Considerable trouble was encountered from tar which coated the engine valves and spindle of the pressure regulator of the calorimeter.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1658
32.	Combustible charged during trial	lbs.	1315
33.	Average B.H.P. of engine during trial	H.P.	25·84
34.	" indicated H.P. of engine during trial	H.P.	39·10
35.	" H.P. taken by exhauster and gas washer	H.P.	3·5
36.	" B.H.P. while gas consumption of engine was taken	H.P.	25·84
37.	" " corresponding to total gas produced	H.P.	25·84
38.	" " " " " and available for outside use, allowing for power used	H.P.	22·34

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	69·8
40.	Dry coal charged per hour	lbs.	69·1
41.	Combustible charged per hour	lbs.	56·0
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	17·4
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	17·2
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	14·0
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	9·46
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·67
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3410
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3280
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3410
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3280
51.	Calorific value of coal charged per hour	B.T.U.	846000
52.	" " gas produced per hour (lower value)	B.T.U.	341000
53.	Steam used in producer per hour	lbs.	85

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	46·3
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	46·7
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	57·8
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	83·9
58.	" " " " " " B.H.P. "	cub. ft.	126·8
59.	Steam used in producer per lb. coal charged	lbs.	1·22
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	26
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	541
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	40·3
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	34·8
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	29·8
65.	Thermal efficiency of engine, based on B.H.P.	per cent.	19·3
66.	Over all efficiency of producer and engine plant	per cent.	7·79
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13170
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	32700

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·70	2·67	2·17
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	3·12	3·09	2·50
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·64	3·61	2·92

TRIAL OF No. 4 PRODUCER WITH COAL No. 34

Date—March 22 and 23, 1909. Trial Number—36

OBSERVATIONS OF GENERAL CONDITIONS

General Notes.

Barometer at beginning of trial	29 75 inches
" " 9 p.m., March 22	29 80 "
" " end of trial	29·83 "
Total water used	36,540 lbs.
Brick in producer base	924 "
Average level of coal below the top plate of the producer	18·3 inches

TIME.			
2.45 a.m.,	March	22	Fire started with 10 lbs. shavings, 40 lbs. wood, and 135 lbs. coke.
4.00 "	"	"	Charged 156 lbs. of coke. Producer on up-draft; natural draf only.
8.20 "	"	"	Charged 125 lbs. of coal.
8.25 "	"	"	On down-draft with fan exhausting directly to the atmosphere.
8.35 "	"	"	On down-draft with blower.
8.45 "	"	"	Charged 125 lbs of coal.
8.55 "	"	"	" 50 " "
8.55 "	"	"	Started engine.
9.00 "	"	"	Started trial.
3.00 p.m.,	"	"	Gas-washer blown through with steam.
9.00 a [illegible]	"	23	Finished trial.

Ne [illegible]; valves not cleaned after trial. Tar removed from wet scrubber, 30 lbs; from pipe [illegible] washer, 5 lbs.

Wet re[illegible] ring the trial	175 lb
A samp[illegible] his when dried weighed	147 "
Wet ref[illegible] the end of the trial	1,177 "
A samp[illegible] of this when dried weighed	143 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 22 and 23, 1909.

Note: R. and B. apparatus used.

Trial Number—36.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9 00 a.m.	9·3	0·9	0·3	9·6	4·3	6·3	69·3	20·5
10 00 "	9·6	0·4	0·0	13·5	3·2	8·0	65·3	24·7
11 00 "	10·0	0·4	0·0	9·7	3·9	9·2	66·8	22·8
12 00 p.m.	10·5	0·5	0·0	12·0	2·9	10·7	63·4	25·6
1 50 "	15·5	0·6	0·0	10·3	1·6	14·9	57·1	26·8
2 45 "	12·3	0·5	0·0	12·1	2·3	14·6	58·2	29·0
3 45 "	14·3	0·5	0·2	11·5	1·7	15·6	56·2	29·0
4 45 "	12·9	0·4	0·1	13·0	3·7	17·0	52·9	33·8
6 10 "	10·0	0·6	0·0	12·9	2·0	10·6	63·9	25·5
7 30 "	12·5	0·5	0·0	12·7	1·9	14·1	58·3	28·7
8 30 "	10·0	0·5	0·2	13·8	2·1	15·0	58·4	31·1
11 30 "	15·8	0·6	0·0	10·0	2·2	13·2	58·2	25·4
12 30 a.m.	11·3	0·5	0·2	12·6	2·0	16·0	57·4	30·8
1 30 "	15·7	0·5	0·1	9·5	2·0	9·0	63·2	21·5
2 30 "	7·4	0·6	0·1	19·1	2·0	4·2	66·6	25·4
3.30 "	8·7	0·5	0·0	14·4	2·1	4·2	70·1	20·7
5 00 "	11·4	0·6	0·0	11·6	2·4	11·7	62·3	25·7
6 30 "	12·6	0·6	0·1	12·5	2·3	14·0	57·9	28·9
7 30 "	12·6	0·6	0·2	12·5	1·6	15·0	57·5	29·3

OBSERVATIONS OF GAS METER AND B. H. P.

Date—March 22 and 23, 1909. Trial Number—36.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
9.00 a.m...	2764220	....	N.B.O.	275	110	165	96311
9.30 " ..	2766030	1810	"	275	110	165	.....
10.00 " ..	2768030	2000	"	275	115	160	....
10.30 " ..	2769740	1710	"	275	115	160	...
11.00 " ..	2771350	1610	"	275	115	160	.....
11.30 " ..	2773050	1700	"	275	115	160	12940
12.00 p.m ..	2774650	1600	"	275	115	160	.
12.30 " ..	2776430	1780	"	275	110	165	. .
1.00 " .	2778185	1755	"	275	110	165	
1.30 " ..	2779920	1735	"	275	110	165	. . .
2.00 " ..	2781760	1840	"	275	110	165	. .
2.30 "	2783790	2030	"	275	110	165	
3.00 " .	2785510	1720	"	275	110	165	.....
3.30 " ..	2787350	1840	"	275	110	165	...
4.00 " ..	2789355	2005	"	275	110	165	....
4.30 " ..	2791265	1910	"	275	110	165	.....
5.00 " ..	2792825	1560	"	275	110	165	....
5.30 " ..	2794560	1735	"	275	110	165	......
6.00 " ..	2796360	1800	"	275	110	165	54440
6.30 " ..	2798290	1930	"	275	110	165	.... .
7.00 " ..	2799060	1670	"	275	110	165	... .
7.30 " ..	2801840	1880	"	275	110	165	.
8.00 " ..	2803692	1852	‘	275	110	165	....
8.30 " ..	2805583	1891	"	275	110	165	.. .
9.00 " ..	2807450	1867	"	275	110	165	....
9.30 " ..	2809390	1940	"	275	110	165	....
10.00 " ..	2811438	2048	"	275	110	165	.. .
10.30 "	....	....	"	275	110	165	.. .
11.00 " ..	2814895	3457	"	275	110	165	...
11.30 " ..	2816635	1740	"	275	110	165	... .
12.00 a.m...	2818520	1885	"	275	110	165	... .
12.30 " ..	2820100	1580		275	110	165	..... .
1.00 " ..	2821720	1620		275	110	165	. .
1.30 " ..	2823330	1610		275	110	165	03130
2.00 " ..	2825085	1755	"	275	110	165	.... .
2.30 " ..	2826995	1910	"	275	110	165	.... .
3.00 " ..	2828925	1930	"	275	115	160	..... .
3.30 " ..	2830740	1815	"	275	115	160	....
4.00 " ..	2832450	1710	"	275	115	160	. . .
4.30 " ..	2834155	1705	"	275	110	165	.
5.00 " ..	2836000	1845	"	275	110	165	. . .
5.30 " ..	2837850	1850	"	275	110	165	.... .
6.00 " ..	2839550	1700	"	275	110	165	..... .
6.30 " ..	2841280	1730	"	275	110	165	....
7.00 " ..	2843250	1970	"	275	110	165	....
7.30 " ..	2845055	1805	"	275	110	165	....
8.00 " ..	2847050	1995	"	275	110	165	....
8.30 " ..	2848775	1725	"	275	110	165	....
9.00 " ..	2850300	1525	"	275	110	165	50901

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—March 22 and 23, 1909

Note: Boys Calorimeter used. Trial Number—36.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
9 00 a.m.	48	½	3·90	14·35	1640	110·4	9 00 a.m.			
9.30 "	50	½	4·39	13·05	1500	94·2	10 30 "	..	75	10 25 a.m.
10 00 "	51·5	½	4.61	13·04	1865	106·8	11 10 "	50	125	11 05 "
10 30 "	49	½	4·81	17·63	1735	150·3	12.15 p.m.	50	175	1.10 p.m.
11 00 "	55	½	5·10	13·80	1735	102·5	1 15 "	50	225	2 05 "
11 30 "	57	½	5·45	14·90	1675	95·2	2 25 "	50	275	
12 00 p.m.	59	½	5·82	14·6	1675	99·0	3 30 "	50	325	4.40 "
12 30 "	60	½	5·97	13·96	1805	98·0	4.45 "	50	375	
1 00 "	61	½	5·67	13·49	1895	100·5	5.30 "	25	400	
1.30 "	62	½	5·55	13·40	1915	102	6 05 "	50	450	6.30 "
2 00 "	63		5·65	13.26	1625	85·0	6 30 "	50	500	
2.30 "	63		5·35	12·30	1895	104·3	7.10 "	75	575	
3 00 "	64		5·70	13·47	1875	98·75	8.20 "	50	625	
3 30 "	65	½	5·69	13·39	1620	98·8	8.50 "	50	675	
4 00 "	65		5·43	12·97	1600	95·5	9.25 "	50	725	9.30 "
4.30 "	67		5·48	12·69	1680	95·9	10.00 "	50	775	
5 00 "	66		5·23	14·76	1610	104·2	11.05 "	50	825	
5.30 "	65	½	5·04	13·66	1745	102·0	12.15 a.m.	50	875	
6 00 "	64	½	4·93	11·47	1695	87·8	1.15 "	50	925	1.40 a.m.
6 30 "	65		5·14	14·05	1755	124	2.15 "	50	975	
7 00 "	65		5·31	17·06	1735	107·5	3.10 "	50	1025	
7.30 "	66		5·[illegible]7	15·60	1610	99·9	3.45 "	50	1075	
8.00 "	66		5·[illegible]	13·83	1735	85·2	4.25 "	50	1125	
8.30 "	67		5·85	14·29	1825	91·5	5.20 "	50	1175	5.15 "
9 00 "	67	½	5·80	13·62	1790	95·0	6.30 "	50	1225	
9 30 "	68		5·75	13·32	1645	98·7	7.15 "	50	1275	
10 00 "	68		5·80	16·42	1680	106·0	8 20 "	50	1325	
10 30 "	68		5·20	14·56	1710	95·0				
11.00 "	68		5·50	15·07	1835	104·4				
11.30 "	69		5·20	14·19	18[illegible]	97·5				
12.00 a.m.	69	½	5·42	14·65	16[illegible]	10[illegible]				
12.30 "	69		5·63	14·59	1600	113				
1.00 "	Gas not burning.									
1.30 "	68	½	5.44	11·66	1600	93·8				
2.00 "	68	½	5·41	13·39	1665	[illegible]				
2.30 "	68	½	5·40	13·14	1800	94·[illegible]				
3 00 "	68		5·32	12·26	1750	96·[illegible]				
3.30 "	68	½	5·03	11·44	1600	100				
4 00 "	68		4·71	12·50	1705	105				
4.30 "	68		4·89	11·67	1770	95·[illegible]				
5.00 "	68		4·91	12·45	1820	108·[illegible]				
5.30 "	68		4·41	12·99	1805	122·7				
6.00 "										
6.30 "	68	½	4·70	13·36	1770	104·1				
7.00 "	68	½	4·93	13·66	1770	105				
7.30 "	68	½	4.79	13·63	1800	108				
8.00 "	68		5·02	13·55	1730	117				
8.30 "	68	½	4·88	12·51	1600	116				

OBSERVATIONS OF TEMPERATURES AND PRESSURES

Date—March 22 and 23, 1909. Trial Number—36.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer O[illegible]	Inlet.	Outlet.
9.00 a.m.	680	52	55	60	3·7	6·5	6·7	7·3	3·1	1·0	50	46
9.30 "	820	54	58	120	3·7	7·2	7·4	6·8	3·1	0·9	54	48
10.00 "	790	58	60	130	3·7	7·3	7·5	6·4	2·8	0·7	67	63
10 30 "	820	60	62	131	3·5	6·9	7·1	6·0	[illegible]	0·8	68	64
11 00 "	770	62	64	136	3·6	6·6	6·8	7·0	4·2	1·6	69	65
11.30 "	820	64	65	135	3·7	7·2	7·4	7·7	3·8	1·3	65	60
12.00 p.m.	800	66	66	128	3·9	7·5	7·7	8·3	3·9	1 3	60	55
12.30 "	800	68	68	128	3·7	6·8	7·0	7·6	4·2	1·5	68	62
1.00 "	800	69	69	130	3·9	7·3	7·5	9·2	4·6	1·0	64	60
1.30 "	870	69	67	128	3·5	5·9	5·1	7·4	4·1	1·4	65	61
2.00 "	840	69	67	128	3·9	7 5	7·7	7·9	4·4	1·5	72	67
2.30 "	790	70	68	129	3·5	5·9	6·1	6·3	3·3	0·9	73	69
3.00 "	820	70	68	138	3·9	7·4	7·6	9·2	4·0	1·3	68	62
3.30 "	840	70	70	141	4·3	8·1	8·3	9·9	4·4	1·5	68	62
4.00 "	850	72	70	135	4·1	7·4	7·6	8·5	3·8	1·0	70	63
4.30 "	760	72	70	126	3·8	6·1	6·3	6·0	2·8	0 [illegible]	64	59
5.00 "	770	71	70	139	3·6	5·8	6 0	6·4	3·2	0·5	62	55
5.30 "	790	70	70	131	3·8	6·1	6·3	8·0	3·8	1·0	51	47
6.00 "	780	68	64	129	3·8	6·5	6·7	8·4	3·8	1·1	49	[illegible]
6.30 "	800	68	67	126	3·8	6·4	6·6	8·2	4·1	1·1	38	31
7.00 "	780	68	68	133	3·8	6·5	6·7	8·6	4·4	1·1	60	55
7.30 "	770	68	68	133	3·8	6·5	6·7	8·7	4·5	1·4	42	[illegible]
8.00 "	760	68	69	135	3·8	6·8	7·0	9·4	4·6	1·7	63	[illegible]
8.30 "	760	68	70	133	3·9	6·8	7·0	8·7	4·4	1·2	77	[illegible]
9.00 "	770	68	70	130	3·9	6·8	7·0	8·6	4·4	1·1	70	67
9.30 "	740	69	70	128	3·8	6 4	6·6	7·3	3·6	1·0	78	75
10.00 "	720	69	70	128	3·8	6·1	6·3	7·6	3·8	1·1	62	60
10.30 "	750	69	70	129	3·8	6·2	6·4	7·8	3·9	1·1	63	[illegible]
11.00 "	800	69	70	130	3·8	6·5	6·7	8·2	4·0	1·0	62	60
11.30 "	800	69	70	129	3·6	6·1	6·3	7·5	3·5	0 6	[illegible]	70
12.00 a.m.	790	69	70	125	3·9	6·6	6·8	8·3	3·7	1 0	64	57
12.30 "	740	70	70	130	3·5	5·4	5·6	6·7	3·4	0·8	[illegible]	78
1.00 "	770	70	69	130	3·9	6·1	6·3	7·9	4·1	1·0	[illegible]	57
1.30 "	810	69	69	131	3·7	5·7	5·9	8·9	4 7	1·5	[illegible]	47
2.00 "	760	69	69	130	3·9	6·8	7·0	11·3	6 9	2·8	57	53
2.30 "	750	69	69	131	3·9	7·4	7·6	9·3	4 4	1·4	[illegible]	38
3.00 "	770	68	70	130	3·9	7·5	7·7	8·7	3·9	1·0	48	41
3.30 "	740	69	70	132	3·7	6·7	6·9	8·6	4·7	1·8	44	40
4.00 "	750	69	70	131	3·8	7·4	7·6	9·8	5·4	2·0	61	56
4.30 "	770	69	70	131	3·5	6·1	6·3	7·1	3·8	1·1	55	51
5.00 "	760	70	70	128	3·5	6·3	6·5	6·7	3·5	0·9	72	68
5.30 "	770	69	70	130	3·8	6·7	6·9	7·5	3·8	1·1	71	65
6.00 "	780	69	70	128	3·9	8·0	8·2	9·7	4·5	1·1	70	66
6.30 "	780	69	70	129	3·9	7·9	8·1	9·6	4·6	1·1	68	64
7.00 "	770	69	70	130	3·9	7·3	7·5	8·1	3·8	1·0	70	65
7.30 "	800	70	70	139	3·8	6·9	7·1	8·6	4·4	1·3	70	65
8.00 "	800	70	70	138	3·9	7·4	7·6	8·7	4·3	1·1	60	56
8.30 "	780	70	70	131	3·9	7·6	7·8	9 2	4·4	1·3	73	69
9.00 "	700	70	70	130	3·3	5·5	5·7	6·0	3·4	1·6	65	61

PRODUCER TRIAL No. 36.

Date—March 22-23, 1909. Producer No. 4, at McGill University.

Time of lighting up—2.45 a.m. Trial commenced 9.00 a.m. March 22; ended 9.00 a.m. March 23.

Duration of trial—24 hours. Kind of fuel—No. 34 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Campbell, Nicoll, Stansfield.

SUMMARY OF OBSERVATIONS.

No.	Item	Unit	Value
	FUEL.		
1.	Total coal charged during trial		
2.	Moisture in coal as charged	lbs.	1325
3.	Calorific value of coal as charged, per lb.	per cent.	1·1
4.	" " of dry coal per lb.	B.T.U.	11590
5.	Proximate analysis of coal as charged (by weight): fixed carbon,	B.T.U.	11720
	56·4; volatile matter, 24·4; ash, 18·1; moisture, 1·1	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon,		
	9·2; volatile matter, 4·2 Total	per cent.	33·4
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	41·7
	GAS.		
8.	Total gas produced during trial (from meter readings)		
9.	Average temperature of gas leaving producer	cub. ft.	86080
10.	" " " at meter	°F.	739
11.	Average temperature of air in producer house	°F.	6[illegible]
12a.	Average higher calorific value of gas per cub. ft. by calorimeter	°F.	68
	(as observed)		
12b.	Average higher calorific value of gas per cub. ft. by calorimeter	B.T.U.	102·3
	(gas dry at 60° and 14·7 lbs. per sq. in.)		
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas	B.T.U.	105·8
	dry at 60° and 14·7 lbs. per sq. in.)		
14.	Average barometric pressure	B.T.U.	97·3
15.	" suction at producer	lbs. sq in.	14·5[illegible]
16.	" suction at exhauster	ins. of water	1·2
17.	" pressure of gas at meter	ins. of water	8·07
		ins. of water	5·2
	STEAM, WATER, ETC.		
18.	Total steam used in producer during trial		
19.	" water used in scrubber and gas washer	lbs.	2280
20.	" tar extracted in scrubber and gas washer	lbs.	365·40
21.	Average power required to drive exhauster	lbs.	45
22.	" " " gas washer	H.P.	2·5
		H.P.	1·5
	ENGINE.		
23.	Total revolutions during trial (from counter)		
24.	Average explosions per minute		309120
25.	Average effective load on brake		103·1
26.	Effective radius of brake wheel	lbs.	164·2
27.	Average mean effective pressure from indicator diagrams	ft.	3·836
28.		lbs. sq. in.	64·25

Notes.

Fire poked at: 10.25, 11.05 a.m.; 1.10, 2.05, 4.40, 6.30, 9.50 p.m.; 1.40, 5.15, 7.10 a.m.

Refuse removed at: 12.00 a.m.; 3.45, 7.00, 11.00 p.m.; 1.35, 4.15, 4.25 a.m.

Behaviour of coal: Worked well.

Average time between poking: 2 hours, 24 minutes.

Clinker: No trouble.

Tar: No trouble.

State of engine valves at end of trial: Did not need cleaning.

Valves last cleaned: March 9, 1909.

29. **ANALYSIS OF DRY COAL.**

Hydrogen	4·0%
Carbon	68·5%
Nitrogen	1·0%
Oxygen	6·3%
Sulphur	0·4%
Total carbon contained by dry coal charge	898·0 lbs.

30. **ANALYSIS OF GAS BY VOLUME.**

Carbon dioxide	11·7%
Oxygen	0·5%
Carbon monoxide	12·3%
Hydrogen	11·7%
Methane	2·4%
Ethylene	0·1%
Nitrogen	61·[illegible]%

REMARKS.

This coal seems to work well in the producer, requiring very little attention and gives no trouble from dirt or tar. The quality of the gas, however, was poor and uneven, the engine frequently slowing down. This coal would be well suited for producer work in large units.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1310
32.	Combustible charged during trial	lbs.	1070
33.	Average B.H.P. of engine during trial	H.P.	25·73
34.	" indicated H.P. of engine during trial	H.P.	37·90
35.	" H.P. taken by exhauster and gas washer	H.P.	4·0
36.	" B.H.P. while gas consumption of engine was taken	H.P.	25·73
37.	" " corresponding to total gas produced	H.P.	25·73
38.	" " " " " " and available for outside use, allowing for power used	H.P.	21·73

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	55·2
40.	Dry coal charged per hour	lbs.	54·6
41.	Combustible charged per hour	lbs.	44·6
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	13·8
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	13·6
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	11·1
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	8·56
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	1366
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3585
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3470
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3585
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3470
51.	Calorific value of coal charged per hour	B.T.U.	640000
52.	" " gas produced per hour (lower value)	B.T.U.	337000
53.	Steam used in producer per hour	lbs.	95·0

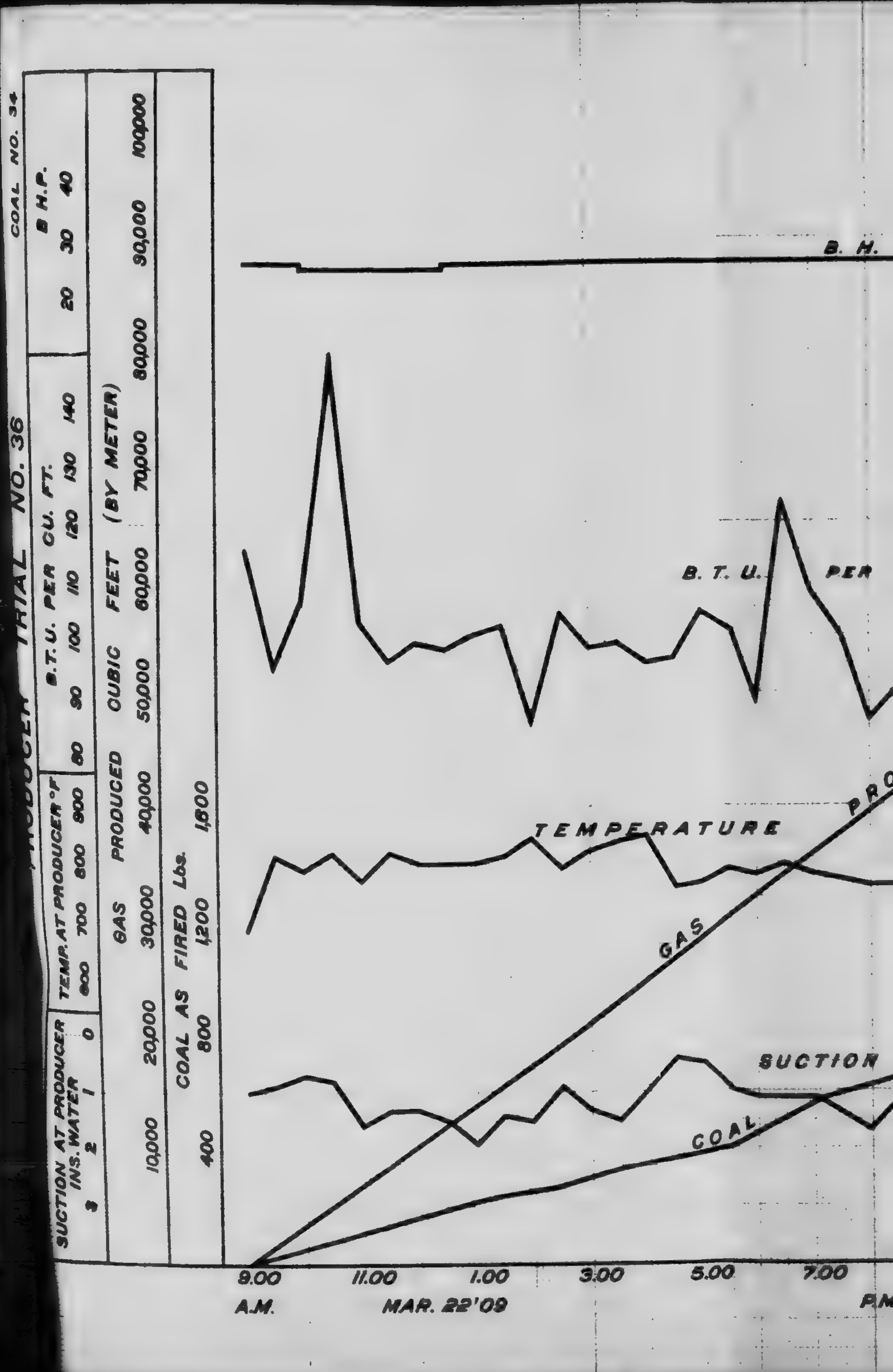
ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	62·9
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	63·6
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	77·9
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	91·5
58.	" " " " " " B.H.P. "	cub. ft.	134·8
59.	Steam used in producer per lb. coal charged	lbs.	1·72
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	27·6
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	425·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	52·9
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	44·6
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	35·7
65.	Thermal efficiency of engine, based on B.H.P	per cent.	19·4
66.	Over all efficiency of producer and engine plant	per cent.	10·26
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13110
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	24800

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·14	2·12	1·73
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·54	2·51	2·10
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·17	3·13	2·56

PRODUCER TRIAL NO. 36

COAL NO. 34



COAL NO. 34
RODUCER TRIAL NO. 36
SUCTION AT PRODUCER INS. WATER
3 2 1 0
TEMP. AT PRODUCER °F
600 700 800 900
B.T.U. PER CU. FT.
80 90 100 110 120 130 140
B H.P.
20 30 40
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600
B. H.
B. T. U. PER
TEMPERATURE
PRO
GAS
SUCTION
COAL
9.00 11.00 1.00 3.00 5.00 7.00
A.M.
MAR. 22'09
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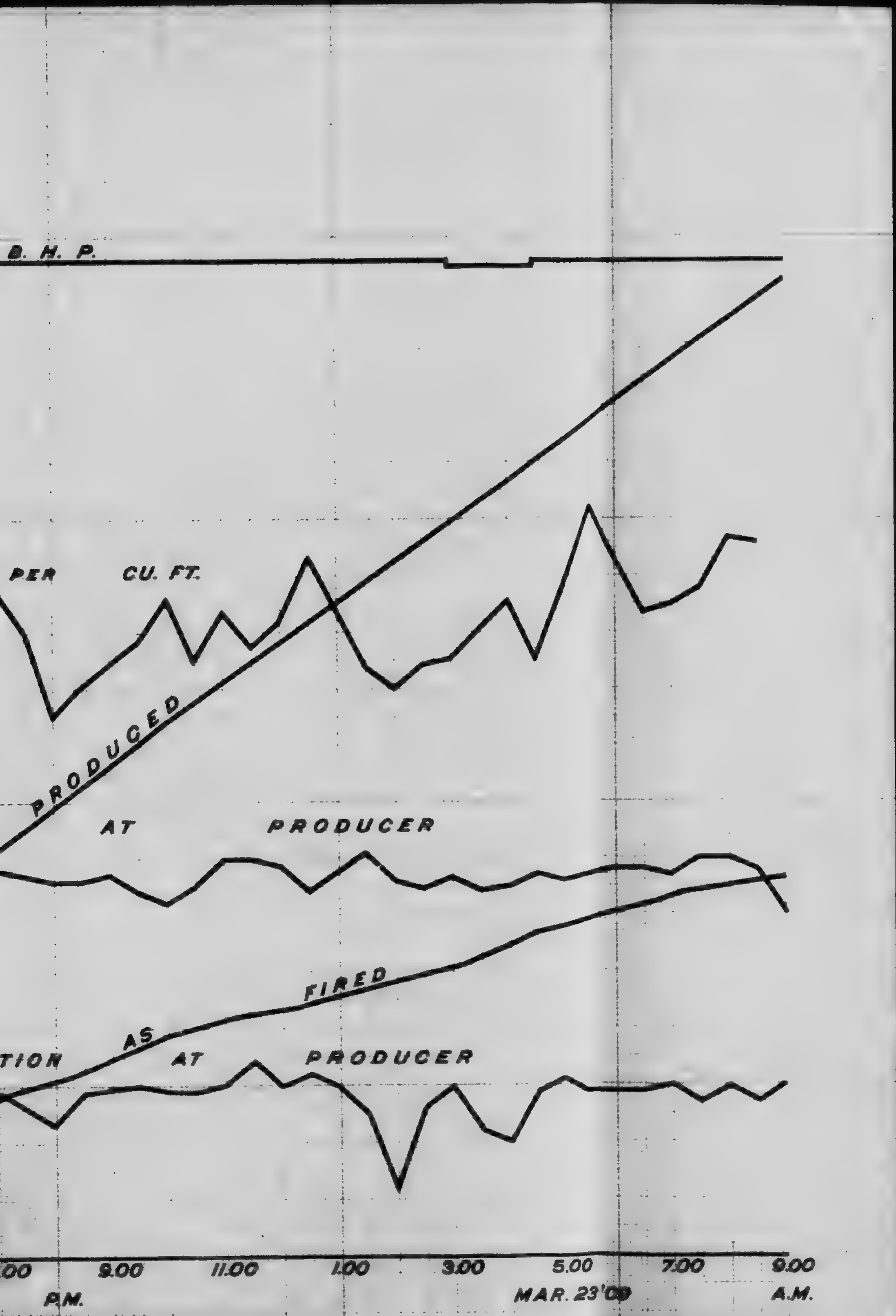

APPENDIX III VOL.V

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WESTERN CROWSNEST PASS COAL FIELD.

BRITISH COLUMBIA.

TRIAL OF No. 4 PRODUCER WITH COAL No. 29

Date—March 18 and 19, 1909. Trial Number—35.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·67 inches.
" " 8.15 p.m.	29·50 "
" " end of trial	29·70 "
Water meter reading at 8.30 a.m., March 18	07,561 imperial gallons.
" " " 7.30 a.m., " 19	09,217 " "
Difference, in 23 hours	1,656 " "
Brick in producer base	956 lbs.
Average level of coal below top plate of producer	16·7 inches.

TIME			
2.45 a.m.,	March	18	Fire started with 10 lbs. of shavings, 20 lbs. of wood, 140 lbs. of coke.
3.45 "	"	"	On down-draft with fan exhausting directly to the atmosphere.
4.00 "	"	"	Charged 170 lbs. of coal.
6.00 "	"	"	" 90 " "
8.00 "	"	"	On down-draft with blower.
8.10 "	"	"	Started engine.
8.10 "	"	"	Charged 135 lbs. of coal.
8.15 "	"	"	Trial started.
1.15 p.m.	"	"	Gas washer blown out with steam.
10.45 "	"	"	" " "
8.15 a.m.,	"	19	Trial completed.

No trouble from dirt or tar in the pipes: valves were not cleaned before trial.
40 lbs. of tar removed from the wet scrubber.
19 lbs. of tar removed from the pipes.

Wet refuse removed from the producer during the trial	491 lbs.
A sample of 250 lbs. of this when dried weighed	166 "
Wet refuse removed from the producer after the trial	1,265 "
A sample of 320 lbs. of this when dried weighed	204 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 18 and 19, 1909. **Trial Number—35.**

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m..	10·1	0·5	0·0	12·6	2·8	9·9	64·1	25·3
10.00 "	8·6	0·4	0·0	16·2	1·9	4·4	68·5	22·5
11.03 " ..	14·0	0·6	0·0	11·3	1·9	13·9	58·3	27·1
12.00 p.m....	12·2	0·4	0·1	12·2	2·4	11·0	61·7	25·7
1.00 "	14·2	0·5	0·0	11·2	2·3	11·3	60·5	24·8
2.00 " .. .	8·9	0·3	0·2	12·4	2·7	8·4	67·1	23·7
3.00 " .. .	6·6	0·2	0·2	15·1	2·9	12·9	62·1	31·1
4.00 "	9·8	0·4	0·0	12·6	2·0	7·9	67·3	22·5
5.00 "	12·4	0·5	0·1	12·8	3·0	16·0	55·2	31·9
6.45 " .. .	8·6	0·4	0·0	12·9	3·0	6·8	68·3	22·7
8.15 "	6·5	0·6	0·2	15·3	4·1	22·0	51·3	41·6
9.45 "	9·7	0·5	0·0	12·3	2·7	12·8	27·8	27·8
11.15 " ...	8·7	0·6	0·2	14·0	2·8	10·8	62·9	27·8
12.30 a.m....	8·4	0·5	0·0	16·1	2·4	8·2	64·4	26·7
1.30 " . .	8·1	0·6	0·0	17·8	2·3	2·8	68·4	22·9
3.00 " ..	10·1	0·5	0·0	14·0	2·1	4·5	68·8	20·6
4.30 " .	10·9	0·7	0·0	14·0	3·1	15·4	55·9	32·5
6.00 " .	8·9	0·5	0·0	12·3	2·0	7·4	68·9	21·7
7 30 " .	9·0	0·5	0·2	16·5	2·2	2·5	69·1	21·4
2 05 " ..	12·5	0·5	0·0	10·9	1·7	3·5	71·0 (Special	16·0 sample.)

OBSERVATIONS OF GAS METER AND B.H.P.

Date—March 18 and 19, 1909.

Trial Number—35.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.15 a.m.	2676300	......	N.B.O.				
8.45 "	2677960	1660	"	275	96	179	40300
9.15 "	2679890	1930	"	300	125	175	
9.45 "	2681860	1970	"	275	115	160	
10.15 "	2683900	2040	"	275	115	160	
10.45 "	2685620	1720	"	275	115	160	
11.15 "	2687590	1970	"	275	115	160	56820
11.45 "	2689250	1660	"	275	115	160	
12.15 p.m.	2691300	2050	"	275	115	160	
12.45 "	2693060	1760	"	275	115	160	
1.15 "	2695060	2000	"	275	115	160	
1.45 "	2691860	1800	"	275	115	160	
2.15 "	2698630	1770	"	275	115	160	75860
2.45 "	2700520	1890	"	275	115	160	
3.15 "	2702410	1890	"	275	115	160	
3.45 "	2704290	1880	"	275	115	160	
4.15 "	2706310	2020	"	275	115	160	
4.45 "	2708010	1700	"	275	115	160	92670
5.15 "	2709680	1670	"	275	115	160	
5.45 "	2711580	1900	"	275	115	160	
6.15 "	2713400	1820	"	275	115	160	
6.45 "	2715740	1740	"	275	115	160	
7.15 "	2717020	1880	"	275	115	160	
7.45 "	2718730	1910	"	275	115	160	
8.15 "	2720470	1740	"	275	115	160	
8.45 "	2722130	1660	"	275	115	160	
9.15 "	2723450	1820	"	275	115	160	
9.45 "	2725650	1730	"	275	115	160	
10.15 "	2737450	1680	"	275	115	160	
10.45 "	2739080	1630	"	275	115	160	
11.15 "	2740660	1680	"	275	110	165	35260
11.45 "	....	...	"	275	110	165	
12.15 a.m.	273[illegible]100	3440	"	275	110	165	
12.45 "	2735960	1860	"	275	110	165	
1.15 "	2738035	2075	"	275	110	165	
1.45 "	2740210	2175	"	275	110	165	
2.15 "	2741910	1700	"	275	110	165	
2.45 "	2743620	1710	"	275	110	165	
3.15 "	2745485	1865	"	275	105	170	60940
3.45 "	2746850	1365	"	275	105	170	
4.15 "	2748745	1895	"	275	105	170	
4.45 "	2750250	1505	"	275	105	170	
5.15 "	2751130	1680	"	275	105	170	
5.45 "	2753570	1640	"	275	105	170	
6.15 "	2755510	1940	"	275	105	170	
6.45 "	2757180	1670	"	275	105	170	
7.15 "	2759055	1875	"	275	105	170	
7.45 "	2761050	1995	"	275	105	170	
8.15 "	2762835	1785	"	275	105	170	
				275	105	170	94821

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—March 18 and 19, 1909. Trial Number—35.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
8.15 a.m.	Thermometer not ready.						8.15 a.m.		lbs.	
8.45 "	57	2/3	5·27	15·51	1735	105·7	9.25 "	25	25	
9.15 "	59	2/3	5·32	14·48	1750	95·2	10 10 "	50	75	
9.45 "	59	7/12	5·23	13·74	1615	93·4	10.50 "	50	125	10.50
10.15 "	59	7/12	5·01	14·53	1695	109·4	11.40 "	50	175	
10.45 "	60	1/2	4·95	11·72	1660	89	12.35 p.m.	50	225	12.50
11.15 "	62	1/2	5·05	11·45	1800	91·2	1.10 "	50	275	
11.45 "	63	2/3	5·18	15·15	1740	103·2	1.45 "	50	325	1.40
12.15 p.m.	61	7/12	4·51	13·41	1615	97·3	2.15 "	50	375	
12.45 "	64	1/2	5·15	13·69	1615	109·7	3.20 "	50	425	3 15
1.15 "	64	7/12	6·00	14·46	1695	97·4	4 10 "	50	475	
1.45 "	65	7/12	5·47	15·62	1830	126·2	5.30 "	50	525	
2.15 "	66	1/2	5·61	14·03	1660	110·9	6.20 "	50	575	6 20
2.45 "	67	1/2	5·70	12·08	1840	93·0	7.10 "	50	625	6 45
3.15 "	65	5/12	5·22	11·28	1600	92·2	7.35 "	50	675	7 00
3.45 "	67	3/4	6·02	17·27	1680	99·8	8.15 "	75	750	
4.15 "	68	3/4	5·87	19·15	1705	119·5	8.55 "	50	800	
4.45 "	68	3/4	5·67	16·67	1735	100·8	9.45 "	50	850	
5.15 "	69	3/4	5 72	15·69	1700	89·5	10.40 "	75	925	
5.45 "	68	3/4	5·40	16·64	1730	102·7	11.45 "	50	975	
6.15 "	68	2/3	5·27	14·80	1660	93·6	11.55 "	50	1025	
6.45 "	68	1/2	5·20	14·25	1730	124	12.20 a.m.	50	1075	
7.15 "	68	1/2	5·73	13·20	1660	48·2	1.55 "	50	1125	
7.45 "	68	5/12	5·60	12·50	1600	105	3.05 "	50	1175	3 00
8.15 "	Gas out in Calorimeter						4.05 "	50	1225	4 05
8.45 "	68	1/4	5·62	10·03	1600	111·8	5.05 "	50	1275	5.05
9.15 "	68	1/2	5·40	12·40	1800	99·7	6.05 "	50	1325	6 05
9.45 "	68	5/12	5·35	11·00	1780	95·3	6.55 "	25	1350	7.05
10.15 "	Gas out in Calorimeter.						7.30 "	25	1375	
10.45 "	69	5/12	7·30	13·75	1800	110·3				
11.15 "	69	5/12	5·73	13·50	1620	119·7				
11.45 "	69	1/3	5·60	12·20	1600	125·3				
12.15 a.m.	68	1/3	5·47	10·56	1760	106·4				
12.45 "	68	7/12	5·66	13·27	1750	90·5				
1.15 "	67	7/12	5·53	12·13	1850	82·9				
1.45 "	Gas out in Calorimeter									
2.15 "	68	1/3	5·96	11·65	1770	119·7				
2.45 "	69	1/3	5·70	10·50	1600	91·3				
3.15 "	69	5/12	5·84	13·01	1975	135·0				
3.45 "	69	1/3	5·75	10·21	1865	99·0				
4.15 "	69	5/12	5·64	13·33	1615	118·1				
4.45 "	69	5/12	5·70	12·97	1600	110·5				
5.15 "	70	5/12	5·83	12·41	1900	118·8				
5.45 "	70	5/12	5·79	10·76	1815	85·7				
6.15 "	70	5/12	5·60	12·55	1770	117·0				
6.45 "	Gas out in Calorimeter									
7.15 "	70	7/12	5·85	13·16	1720	85·4				
7.45 "	70	7/12	5·87	14·81	1780	108·1				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—March 18 and 19, 1909.

Trial Number—35

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 15 a.m	660	60	51	112	3·2	5·1	5·3	6·2	...	0·4		...
8.45 "	700	61	62	137	3·3	6·0	6·2	8·0	3·0	0·6	62	59
9.15 "	780	64	66	139	3·6	7·6	7·8	9·6	3·7	1·0	[illegible]	62
9 45 "	800	66	64	137	3·6	7·4	7·6	9·3	3·7	[illegible]		55
10 15 "	760	66	64	138	3·1	5·3	5·5	6·8	3·0	[illegible]		[illegible]
10 45 "	780	66	65	136	3·7	8·0	8·2	10·5	3·8	[illegible]		[illegible]
11 15 "	760	68	67	133	3·4	7·2	7·4	8·2	3·2	0·7		61
11·45 "	760	68	67	134	3·6	7·0	7·2	10·6	4·5	1·9		60
12 15 p.m	790	[illegible]	64	135	3·5	6·2	6·4	8·6	3·2	0·8		59
12 45	840		68	145	3·5	7·0	7·2	10·6	4·4	1·6		
1 15 "	780	[illegible]	68	133	3·8	8·0	8·2	10·7	4·0	[illegible]		[illegible]
1 45 "	750	74	70	133	3·1	6·7	6·9	7·2	3·2	[illegible]		[illegible]
2 15 "	760	75	70	142	3·5	6·7	6·9	9·0	3·8	1·2		[illegible]
2 45 "	750	73	71	134	3·6	7·0	7·2	10·0	4·0	1·6		[illegible]
3 15 "	710	70	66	147	3·4	6·0	6·2	8·7	3·2	0·8		[illegible]
3 45 "	720	70	69	147	3·4	5·7	5·9	8·3	3·2	0·7		48
4 15 "	860	72	71	147	3·5	7·0	7·2	10·4	4·0	1·6		53
4.45 "	820	72	72	148	3·5	7·0	7·2	10·0	3·7	[illegible]		50
5 15 "	770	73	72	148	3·4	6·4	6·6	10·0	3·2	0·5	[illegible]	45
5 45 "	800	72	70	148	3·4	6·4	6·6	9·6	3·6	0·7	52	[illegible]
6 15 "	790	72	70	150	3·3	6·6	6·8	9·8	3·5	[illegible]	35	
6 45 "	740	72	71	146	3·5	6·0	6·2	9·8	4·8	[illegible]	80	[illegible]
7 15 "	740	72	70	145	3·0	6·0	6·2	8·7	3·5	0·7	63	60
7.45 "	740	72	70	142	3·1	7·1	7·3	11·0	4·1	[illegible]		
8 15 "	740	72	69	143	3·4	6·9	7·2	11·0	4·0	[illegible]	55	
8 45 "	720	72	70	148	3·0	5·3	5·5	8·0	3·2	[illegible]	68	
9 15 "	750	73	70	149	3·1	6·0	6·2	9·5	4·0		67	
9 15 "	730	72	69	133	3·2	6·5	6·7	9·2	3·0		60	
10 15 "	740	72	68	135	3·2	6·6	6·8	10·0	2·8		60	
10 45 "	680	73	72	136	3·1	5·0	5·2	8·6	3·1	[illegible]	70	
11 15 "	730	78	70	132	3·2	6·4	6·6	9·0	3·8	[illegible]	70	
11 45 "	700	78	70	134	3·0	6 3	6·5	6·7	3·2	1·5	72	
12 15 a.m	720	76	70	136	3·3	[illegible]	6·7	10·5	4·4	2·3	60	
12.45 "	710	72	70	133	3·3	6·5	6·7	10·2	4·1	0·7	61	
1.15 "	740	70	69	134	3·7	8·0	8·2	11·7	4·5	0·8	58	[illegible]
1.45 "	760	71	70	133	3·9	8·1	8·3	11·7	4·3	0·5	61	
2 15 "	700	72	72	139	3·2	5·5	5·7	8·0	3·6	0·3	66	
2.45 "	730	72	71	130	3·3	6·1	6·3	9·3	3·8	1·7	75	[illegible]
3 15 "	780	72	70	128	3·1	5·0	5·2	7·4	3·5	1·5	71	64
3 45 "	760	72	72	142	3·3	6·3	6·5	8·7	3·6	1·3	63	59
4 15 "	760	72	72	135	3·2	5·7	5·9	8·0	3·5	1·2	63	58
4 45 "	730	72	72	135	3·1	5·1	5·3	7·2	3·2	1·1	70	66
5 15 "	700	73	73	136	3·0	4·7	4·9	5·2	3·0	1·5	71	66
5.45 "	730	71	72	135	3·4	6·2	6·5	8·9	3·9	2·4	60	55
6.15 "	790	72	72	137	3·5	6·8	7·0	9·4	3·8	1·1	50	43
6.45 "	730	72	72	140	3·1	5·7	5·9	8·1	3·4	2·2	52	48
7.15 "	750	72	72	139	3·6	7·5	7·7	10·9	4·0	1·4	60	55
7 45 "	720	72	73	140	3·1	5·2	5·4	7·2	2·7	1·2	70	[illegible]
8.15 "	760	72	72	139	3·6	7·5	7·7	11·0	4·2	1·5	71	66

PRODUCER TRIAL No. 35.

Date—March 18-19, 1909. Producer No. 4, at McGill University.

Time of lighting up—2.43 a.m. Trial commenced 8.15 a.m., March 18; ended 8.15 a.m., March 19.

Duration of trial—24 hours. Kind of fuel—No. 29 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1375
2.	Moisture in coal as charged	per cent.	1·1
3.	Calorific value of coal as charged, per lb	B.T.U.	13330
4.	" " of dry coal per lb	B.T.U.	13480
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 67·8; volatile matter, 25·1; ash, 6·0; moisture, 1·1	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 62·6; volatile matter, 3·5 ... Total	per cent.	66·1
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43·3

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	86535
9.	Average temperature of gas leaving producer	°F.	710
10.	" " " at meter	°F.	71
11.	Average temperature of air in producer house	°F.	69
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	104·1
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	110·2
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	102·3
14.	Average barometric pressure	lbs. sq in.	14·56
15.	" suction at producer	ins. of water	1·1
16.	" suction at exhauster	ins. of water	9·1
17.	" pressure of gas at meter	ins. of water	4·88

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2184
19.	" water used in scrubber and gas washer	lbs.	33030
20.	" tar extracted in scrubber and gas washer	lbs.	50
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		309042
24.	Average explosions per minute		102·9
25.	Average effective load on brake	lbs.	163·9
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	63·55

28. **Notes.**

Fire poked at: 10 50 a m.; 12 50, 1 40, 3.15, 6 20, 6.45, 7 00 p m ; 3.00, 4.05, 5 05, 6 05, 7.05 a m
Refuse removed at: 10 50, 11 45 a m.; 1 40, 3.15, 4.05, 8 15, 10 40 p m ; 12.15, 12 50, 5 00 a m
Behaviour of coal: Fairly good
Average time between poking: 2 hours
Clinker: No trouble
Tar: Very little produced.
State of engine valves at end of trial: did not need cleaning
Valves last cleaned: March 9, 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·5%
Carbon	76·1%
Nitrogen	1·3%
Oxygen	7·3%
Sulphur	0·6%

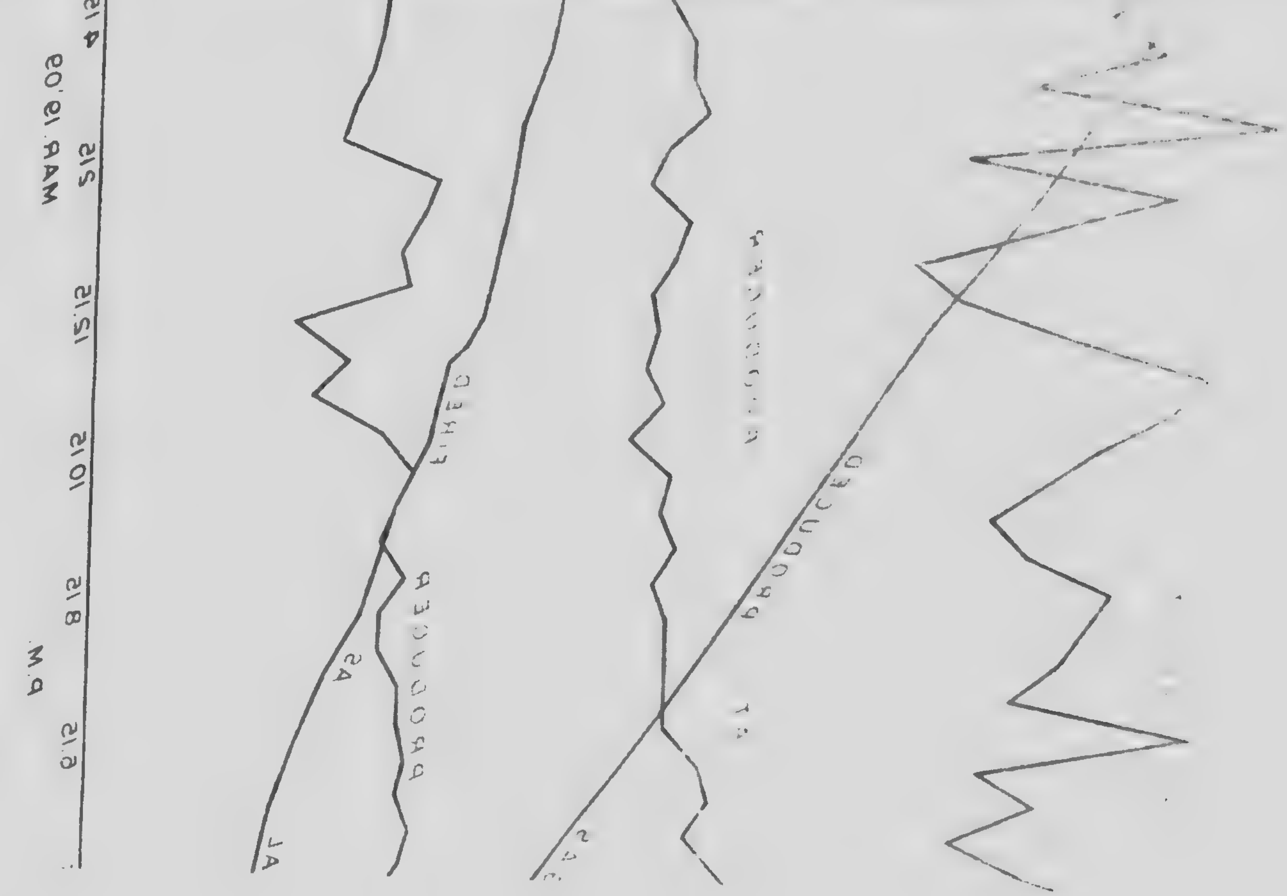
Total carbon contained by dry coal charged 1035·0 lbs.

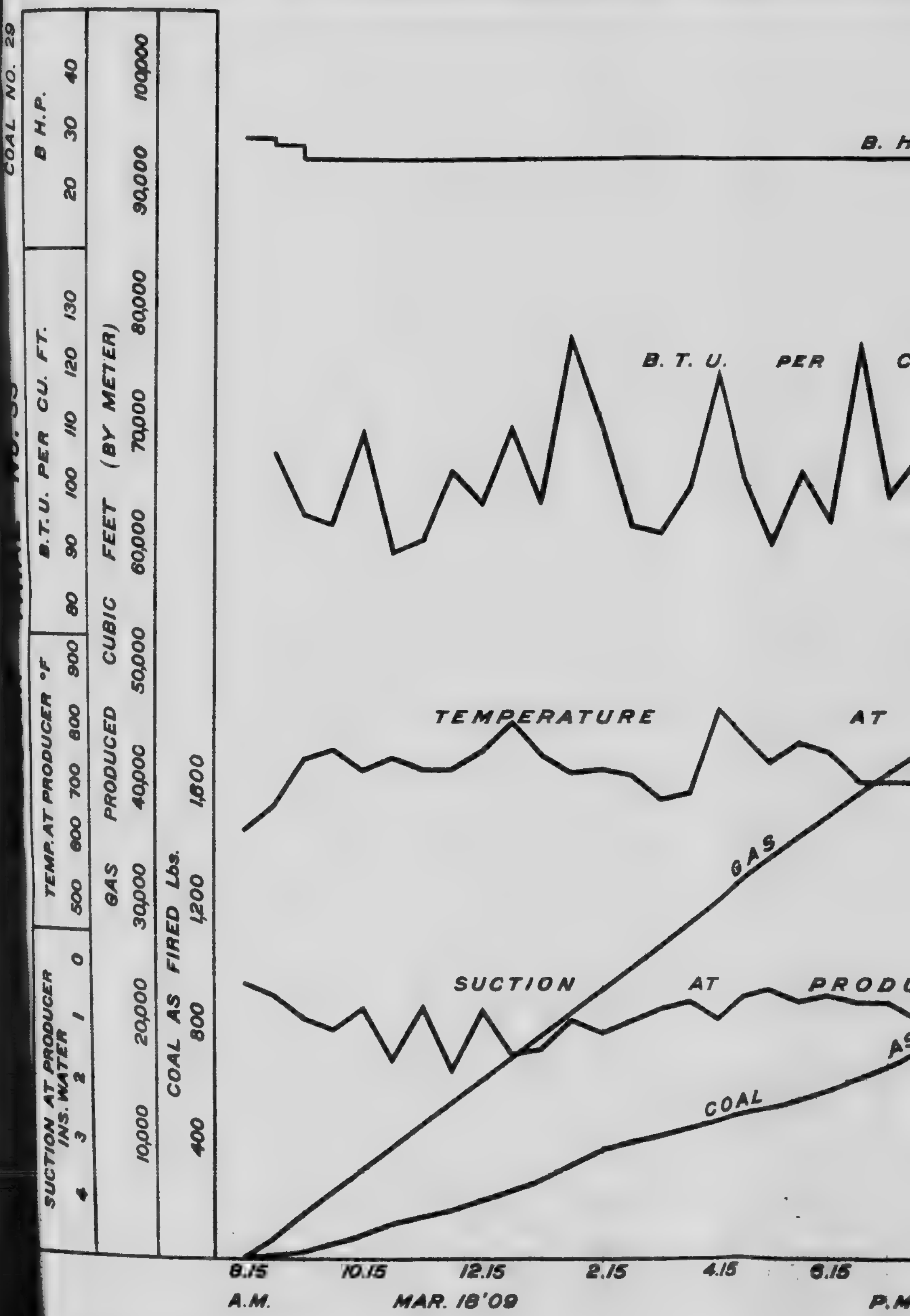
30. ANALYSIS OF GAS BY VOLUME

Carbon dioxide	9·8%
Oxygen	0·5%
Carbon monoxide	13·7%
Hydrogen	9·9%
Methane	2·6%
Ethylene	0·1%
Nitrogen	63·4%

PRODUCER TRIAL NO. 35

COAL NO. 29




COAL NO. 29
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
TEMP. AT PRODUCER °F
500 600 700 800 900
B.T.U. PER CU. FT.
80 90 100 110 120 130
B H.P.
20 30 40
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600
B. H
B. T. U. PER C
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8.15 10.15 12.15 2.15 4.15 6.15
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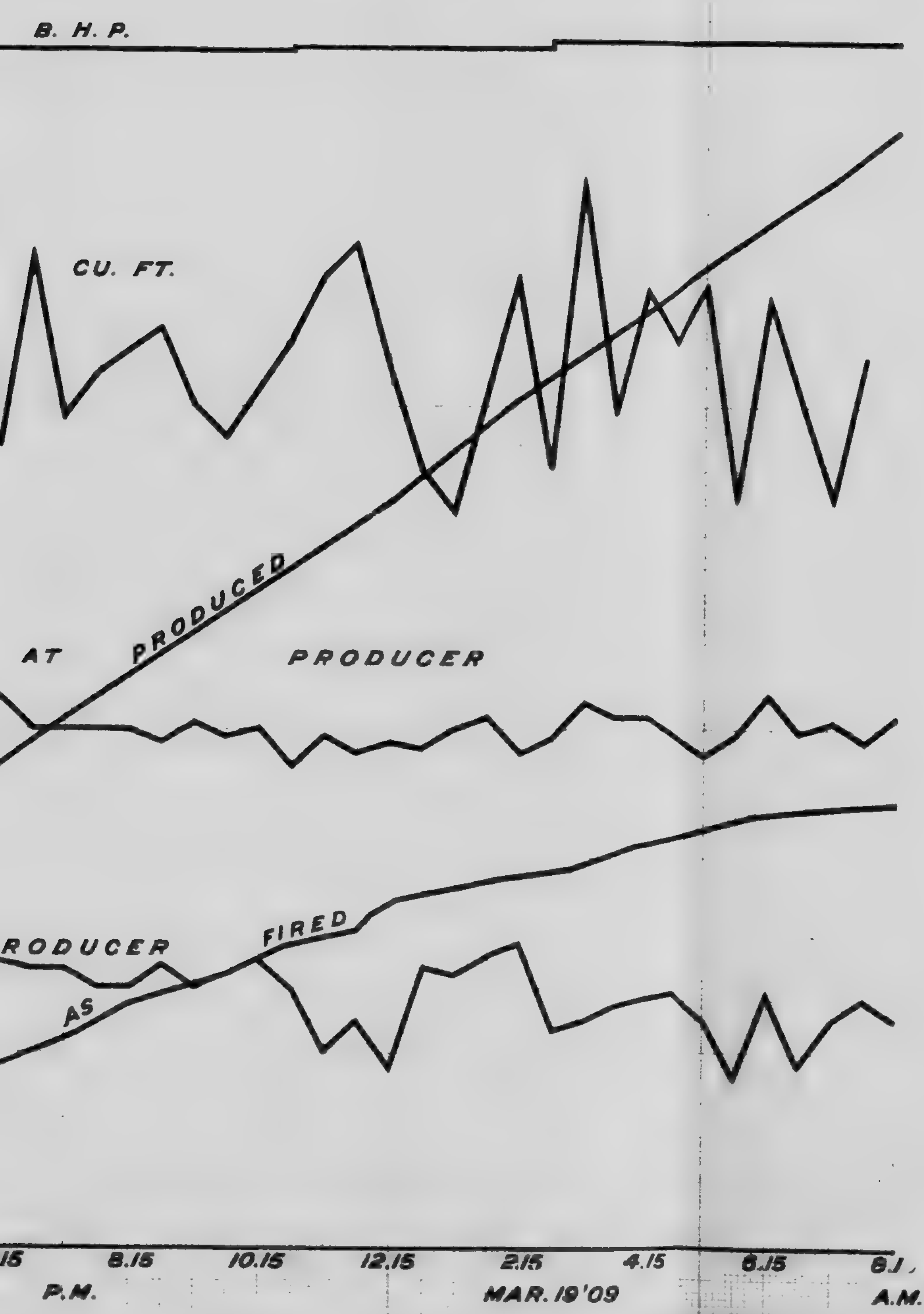
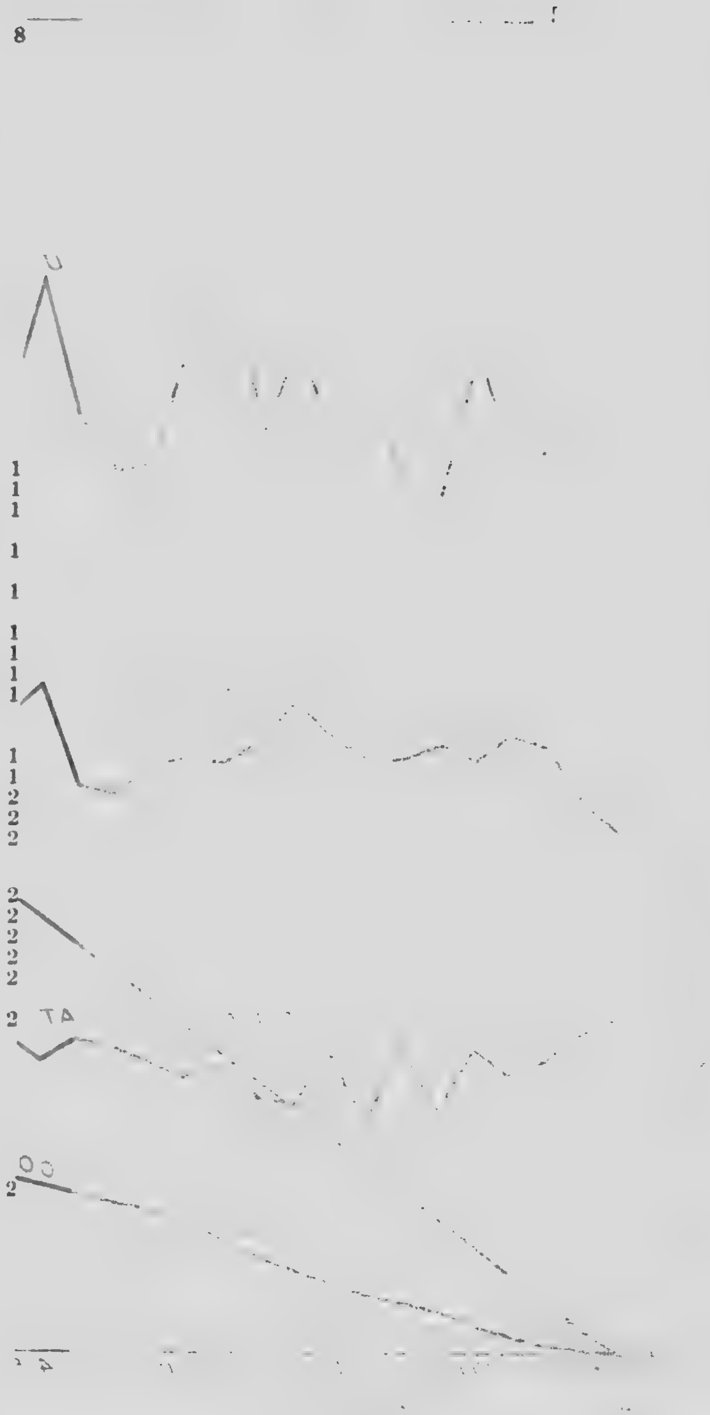


APPENDIX III VOL.V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Remarks.

This coal seems to work well in the producer, as far as clinker is concerned, and will supply sufficient gas without much attention. The quality of the gas is poor. No trouble experienced during the run from dirt or tar in the pipes.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	1360
32.	Combustible charged during trial	lbs.	1277
33.	Average B.H.P. of engine during trial	H.P.	25·67
34.	" indicated H.P. of engine during trial	H.P.	37·44
35.	" H.P. taken by exhauster and gas washer	H.P.	4·0
36.	" B.H.P. while gas consumption of engine was taken	H.P.	25·67
37.	" " corresponding to total gas produced	H.P.	25·67
38.	" " " " " " and available for outside use, allowing for power used	H.P.	21·67

Hourly Quantities.

39.	Coal charged per hour	lbs.	57·3
40.	Dry coal charged per hour	lbs.	56·7
41.	Combustible charged per hour	lbs.	53·2
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	14·3
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	14·2
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	13·3
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	8·92
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	11·36
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3605
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3408
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3605
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3408
51.	Calorific value of coal charged per hour	B.T.U.	764000
52.	" " gas produced per hour (lower value)	B.T.U.	348900
53.	Steam used in producer per hour	lbs.	91·0

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	59·5
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	60·2
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	64·1
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	91·1
58.	" " " " " " B.H.P. "	cub. ft.	132·7
59.	Steam used in producer per lb. coal charged	lbs.	1·59
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	24·0
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	382·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	45·7
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	38·6
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	32·2
65.	Thermal efficiency of engine, based on B.H.P	per cent.	18·7
66.	Over all efficiency of producer and engine plant	per cent.	8·56
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13590
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	29726

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·23	2·21	2·07
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·64	2·61	2·45
71	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·17	3·13	2·94

TRIAL OF No. 4 PRODUCER WITH COAL No. 26

Date—April 5 and 6, 1909. **Trial Number—40.**

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·83 inches.
" " 8 p.m., April 5	29·70 "
" " end of trial	29·64 "
Total water used	34,070 lbs.
Brick in producer base	990 "
Average level of coal below the top plate of the producer	16·2 inches.

Time.		
4.00	a.m., April 5	Fire started with 40 lbs. of wood, and 135 lbs. of coke
5.00	" " "	On down-draft with fan exhausting directly to atmosphere.
5.30	" " "	Charged 120 lbs. of coal.
6.30	" " "	" 60 " "
7.00	" " "	" 60 " "
7.30	" " "	" 60 " "
8.00	" " "	" 60 " "
8.30	" " "	" 30 " "
8.30	" " "	On down-draft with exhauster.
8.40	" " "	Started engine.
8.45	" " "	Trial commenced.
8.45	" " 6	Trial completed.

T[illegible] moved from wet scrubber	24 lbs.
Wet refuse removed during the trial	125 "
When dried this refuse weighed	81 "
Wet refuse removed at the end of the trial	1,065 "
A sample of 222 lbs. of this when dried	124 "

The valves were not cleaned after the trial

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 5 and 6, 1909. Trial Number—40.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m.	10·7	0·5	0·3	8·5	3·3	11·1	65·6	23·2
10.00 "	12·9	0·7	0·1	11·5	2·0	11·0	61·8	24·6
11.00 "	11·7	0·6	0·0	12·5	2·0	11·9	61·3	26·4
12.00 p.m.	12·4	0·4	0·0	12·4	2·4	8·9	63·5	23·7
1.00 "	12·6	0·5	0·0	12·3	1·6	10·8	62·2	24·7
2.00 "	14·6	0·5	0·0	11·2	2·1	9·4	62·2	22·7
3.00 "	12·1	0·5	0·0	10·4	2·5	14·4	60·1	27·3
4.00 "	13·1	0·4	0·0	11·4	2·0	13·3	59·3	26·7
5.00 "	11·9	0·4	0·1	12·5	2·3	14·2	58·6	29·1
7.00 "	13·9	0·7	0·0	11·6	2·1	11·0	60·7	24·7
8.30 "	12·6	0·6	0·0	11·7	2·0	13·2	59·9	26·9
10.00 "	13·0	0·4	0·0	12·7	2·4	14·5	57·0	29·6
11.30 "	13·1	0·5	0·2	11·5	2·1	11·8	60·8	25·6
1.00 a.m.	13·2	0·5	0·0	12·0	1·9	10·4	62·0	24·3
2.30 "	13·6	0·5	0·0	11·3	1·9	10·4	62·3	23·6
4.00 "	13·9	0·6	0·1	12·6	2·0	16·2	55·2	30·3
5.30 "	13·4	0·5	0·0	11·4	2·4	12·9	59·4	26·7
7.00 "	12·8	0·7	0·0	11·3	2·4	10·9	61·9	24·6

OBSERVATIONS OF GAS METER AND B. H. P.

Date—April 5 and 6, 1909. **Trial Number—40.**

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.45 a.m.	3090400	....	N.B.O.	275	115	160	51440
9.15 “	3091860	1460	“	275	115	160	....
9.45 “	3093930	2070	“	275	115	160	....
10.15 “	3096080	2150	“	275	115	160	....
10.45 “	3098080	2000	“	275	115	160	....
11.15 “	3100190	2110	“	275	115	160	....
11.45 “	3102030	1840	“	275	115	160	....
12.15 p.m.	3104210	2180	“	275	115	160	....
12.45 “	3106150	1940	“	275	115	160	....
1.15 “	3108080	1930	“	275	115	160	....
1.45 “	3109980	1900	“	275	115	160	....
2.15 “	3111840	1860	“	275	115	160	....
2.45 “	3113780	1940	“	275	115	160	....
3.15 “	3115630	1850	“	275	115	160	....
3.45 “	3117540	1910	“	275	115	160	....
4.15 “	[illegible]	1840	“	275	115	160	....
4.45 “	[illegible]	2060	“	275	115	160	04610
5.15 “	[illegible]	1840	“	275	115	160	....
5.45 “	[illegible]	1910	“	275	115	160	....
6.15 “	3126970	1780	“	275	115	160	....
6.45 “	3128860	1890	“	275	115	160	....
7.15 “	3130820	1960	“	275	115	160	....
7.45 “	3132580	1760	“	275	115	160	24631
8.15 “	3134593	2013	“	275	115	160	....
8.45 “	3136525	1932	“	275	115	160	....
9.15 “	3138652	2127	“	275	115	160	....
9.45 “	3140877	2225	“	275	115	160	....
10.15 “	3142790	1913	“	275	115	160	....
10.45 “	3144662	1872	“	275	115	160	....
11.15 “	3146580	1918	“	275	115	160	....
11.45 “	3148400	1820	“	275	115	160	....
12.15 a.m.	3150425	2025	“	275	115	160	....
12.45 “	3152280	1855	“	275	115	160	56277
1.15 “	3154190	1910	“	275	115	160	....
1.45 “	3156180	1990	“	275	115	160	....
2.15 “	3158220	2040	“	275	115	160	....
2.45 “	3160350	2130	“	275	115	160	....
3.15 “	3162250	1900	“	275	115	160	....
3.45 “	3164350	2100	“	275	115	160	....
4.15 “	3165900	1550	“	275	115	160	....
4.45 “	3168000	2100	“	275	115	160	....
5.15 “	3169990	1990	“	275	115	160	....
5.45 “	3171860	1870	“	275	115	160	....
6.15 “	3174000	2140	“	275	115	160	....
6.45 “	3175850	1850	“	275	115	160	....
7.15 “	3179930	2080	“	275	115	160	....
7.45 “	3179770	1840	“	275	115	160	....
8.15 “	3181750	1980	“	275	115	160	....
8.45 “	3183500	1750	“	275	115	160	10810

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED

Date—April 5 and 6, 1909. **Trial Number—40.**

Note: Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent. Inlet	Water Temp. Deg. Cent. Outlet	Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
								lbs.	lbs.	
8.45 a.m. .	52	$\frac{3}{4}$	6·49	18·06	1650	100·8	8.45 a.m.	.....	.....	8.50 a.m.
9.15 “ ..	54	$\frac{2}{3}$	4·70	14·95	1700	92	9.00 a.m.	50	50	....
9.45 “ ..	56	$\frac{2}{3}$	4·38	15·23	1730	99	9.45 “	50	100	10.55 a.m
10.15 “ ..	57	$\frac{2}{3}$	4·60	15·11	1600	100	11.00 “	50	150	....
10.45 “ ..	58	$\frac{2}{3}$	4·64	14·14	1610	90·8	12.15 p.m.	50	200	....
11.15 “ ..	59	$\frac{2}{3}$	4·59	15·23	1640	103·7	1.30 “	50	250	....
11.45 “ ..	60	$\frac{2}{3}$	4·58	14·79	1650	100·1	3.00 “	50	300	2.55 p.m.
12 15 p.m. .	62	$\frac{2}{3}$	4·59	15·17	1660	104·4	4.25 “	50	350	....
12.45 “ ..	63	$\frac{2}{3}$	4·97	15·03	1690	101	5.40 “	50	400	5.35 “
1.15 “ ..	64	$\frac{2}{3}$	5·01	15·73	1700	108·4	7.00 “	50	450	7.00 “
1.45 “ ..	65	$\frac{2}{3}$	5·33	13·77	1755	88	8.15 “	50	500	....
2.15 “ ..	65	$\frac{2}{3}$	5·66	16·15	1600	103·5	9.27 “	50	550	9.25 “
2.45 “ ..	67	$\frac{2}{3}$	5·43	15·55	1655	99·5	10.50 “	50	600	....
3.15 “ ..	67	$\frac{2}{3}$	5·59	16·36	1655	106	12.00 “	50	650	....
3.45 “ ..	68	$\frac{2}{3}$	5·89	16·29	1665	103	1.15 a.m.	50	700	....
4.15 “ ..	68	$\frac{2}{3}$	5·81	15·20	1680	93·8	2.30 “	50	750	....
4.45 “ ..	69	$\frac{2}{3}$	5·73	17·06	1730	103·3	3.45 “	50	800	3.10 a.m.
5.15 “ ..	68	$\frac{2}{3}$	5·55	16·26	1755	99·3	5.00 “	50	850	....
5.45 “ ..	67	$\frac{2}{3}$	5·57	17·41	1770	110·7	6.15 “	50	900	....
6.15 “ ..	67	$\frac{2}{3}$	5·70	16·47	1795	102·1	7.45 “	50	950	7.45 “
6.45 “ ..	67	$\frac{2}{3}$	5·36	15·43	1640	98·3				
7.15 “ ..	67	$\frac{2}{3}$	5·63	16·56	1650	107·2				
7.45 “ ..	66	$\frac{2}{3}$	5·68	15·52	1690	98·7				
8.15 “ ..	66	$\frac{2}{3}$	5·65	15·17	1760	99·5				
8.45 “ ..	65	$\frac{2}{3}$	5·55	14·25	1770	99·0				
9.15 “ ..	64	$\frac{2}{3}$	5·25	13·27	1920	91·5				
9.45 “ ..	64	$\frac{7}{12}$	5·30	14·20	1745	105·4				
10.15 “ ..	65	$\frac{7}{12}$	5·43	14·29	1715	103·2				
10.45 “ ..	65	$\frac{7}{12}$	5·47	13·82	1750	99·2				
11.15 “ ..	65	$\frac{7}{12}$	5·42	14·36	1730	105·1				
11.45 “ ..	65	$\frac{7}{12}$	5·45	13·30	1740	92·8				
12.15 a m. .	65	$\frac{7}{12}$	5·53	14 43	1780	107·8				
12.45 “ ..	66	$\frac{7}{12}$	5·60	14·27	1880	111·0				
1.15 “ ..	67	$\frac{1}{2}$	5·70	13·85	1615	104·3				
1.45 “ ..	67	$\frac{2}{3}$	5·50	15·06	1720	97·1				
2.15 “ ..	67	$\frac{2}{3}$	5·55	. 45	1640	96·5				
2.45 “ ..	67	$\frac{2}{3}$	5·76	15·60	1630	95·4				
3.15 “ ..	67	$\frac{2}{3}$	5·79	14·45	1730	89·0				
3.45 “ ..	67	$\frac{2}{3}$	5·86	17·56	1675	116·5				
4.15 “ ..	67	$\frac{2}{3}$	5·83	15·44	1680	96·0				
4.45 “ ..	67	$\frac{2}{3}$	5·83	15·06	1685	92·5				
5.15 “ ..	67	$\frac{2}{3}$	5·79	14·71	1710	91·6				
5.45 “ ..	67	$\frac{2}{3}$	5·80	15·35	1740	98·8				
6.15 “ ..	67	$\frac{2}{3}$	5·70	15·46	1750	101·5				
6.45 “ ..	67	$\frac{2}{3}$	5·74	14·75	1775	95·1				
7.15 “ ..	67	$\frac{7}{12}$	5·75	15·35	1610	105·0				
7.45 “ ..	67	$\frac{7}{12}$	5·86	14·46	1610	94·0				
8.15 “ ..	68	$\frac{7}{12}$	5·92	15·37	1690	108·4				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 5 and 6, 1909. Trial Number—40

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.45 a.m.	460	53	53	60	3·0	5·2	5·7	10·4	2·8	0·7	71	68
9.15 "	590	55	58	145	3·8	7·0	7·2	8·6	3·6	0·7	70	67
9.45 "	690	58	62	135	4·0	7·8	8·0	10·0	4·3	1·1	56	48
10.15 "	700	60	64	136	3·9	7·0	7·2	8·2	3·5	0·4	34	27
10.45 "	730	62	65	136	4·2	8·1	8·3	9·5	3·9	0·6	31	23
11.15 "	730	62	63	133	3·9	6·8	7·0	7·5	3·3	0·7	27	20
11.45 "	720	64	67	133	4·1	7·8	8·0	9·2	4·0	1·0	28	21
12.15 p.m.	740	64	68	132	4·2	7·7	7·9	9·3	4·0	1·3	28	21
12.45 "	750	66	69	133	3·8	6·2	6·4	6·8	3·0	0·9	15	06
1.15 "	750	66	70	133	4·0	7·5	7·7	8·7	3·6	1·0	16	07
1.45 "	810	68	70	131	3·6	8	6·0	7·1	4·0	1·4	72	67
2.15 "	760	70	71	133	4·2	4	8·6	10·0	3·5	1·1	71	67
2.45 "	740	73	72	140	3·6	·8	6·0	6·5	3·4	1·0	63	56
3 15 "	780	74	72	140	3·9	6·7	6·9	7·5	3·5	1·0	68	62
3 45 "	780	74	72	142	4·0	6·9	7·1	7·3	3·5	1·0	65	59
4.15 "	770	74	72	140	3·7	6·1	6·3	6·6	3·4	1·0	70	64
4.45 "	790	72	72	142	4·0	7·5	7·7	8·4	3·5	1·0	69	64
5.15 "	750	71	72	148	3·8	6·0	6·2	6·5	3·3	0·9	69	64
5.45 "	770	70	69	146	3·6	6·0	6·2	6·9	3·3	1·0	77	65
6.15 "	770	70	69	147	3·7	6·3	6·5	7·0	3·3	1·0	68	62
6.45 "	780	70	68	148	3·8	6·9	7·1	8·0	3·7	1·1	68	62
7.15 "	810	70	68	157	3·8	6·2	6·4	7·4	3·8	1·1	69	60
7.45 "	770	70	67	145	3·6	6·1	6·3	7·0	3·4	1·0	71	63
8.15 "	780	70	67	145	4·0	7·2	7·4	8·2	4·0	1·1	71	65
8.45 "	780	70	67	145	3·8	6·7	6·9	7·8	3·6	1·0	70	64
9.15 "	780	68	66	140	4·1	8·0	8·2	9·7	4·2	1·3	70	64
9.45 "	830	69	66	134	4·1	8·0	8·2	9·9	4·3	1·3	72	63
10.15 "	760	70	67	137	3·5	6·0	6·2	6·5	3·3	0.9	70	64
10.45 "	790	70	69	131	4·0	7·9	8·1	9·5	4·1	1·3	67	61
11.15 "	760	70	69	134	3·8	6·2	6·4	7·0	3·5	1·0	69	63
11.45 "	780	70	69	130	4·0	7·9	8·1	9·6	4·1	1·2	62	57
12.15 a.m.	760	71	69	131	3·6	6·0	6·2	6·4	3·3	0·9	62	57
12.45 "	770	71	69	132	3·9	7·0	7·2	7·6	3·5	1·0	67	62
1.15 "	760	72	70	136	3·8	6·9	7·1	7·2	3·6	1·1	72	66
1.45 "	800	72	69	138	4·0	7·5	7·7	8·9	4·0	1·3	64	57
2.15 "	800	72	70	136	4·0	7·3	7·5	8·9	4·0	1·4	69	62
2.45 "	800	72	70	138	3·8	6·9	7·1	8·3	4·0	1·2	70	64
3.15 "	780	72	69	137	3·8	7·0	7·2	8·4	4·0	1·3	64	58
3 45 "	780	72	70	135	3·6	6·0	6·2	7·0	3·9	1·2	63	55
4 15 "	770	72	69	135	3·5	5·9	6·1	7·4	3·9	1·3	60	52
4 45 "	840	72	69	143	4·3	8·7	8·9	10·7	4·4	1·5	68	60
5 15 "	810	72	70	143	3·7	6·5	6·7	7·5	3·6	3·6	66	58
5 45 "	810	72	70	152	3·9	7·3	7·5	9·1	4·0	1·1	67	60
6 15 "	820	72	69	146	4·0	7·3	7·5	9·0	4·0	1·2	63	56
6.45 "	810	72	68	148	3·7	6·5	6·7	7·8	3·7	1·2	71	64
7.15 "	810	72	70	148	3·8	6·6	6·8	7·6	3·7	1·2	67	61
7.45 "	800	72	70	146	4·0	7·5	7·7	9·2	4·0	1·3	66	60
8.15 "	800	72	72	149	3·7	6·2	6·4	7·4	3·8	1·3	67	61
8.45 "	780	72	71	150	3·6	6·3	6·5	7·6	4·0	1·1	68	62

PRODUCER TRIAL No. 40.

Date—April 5-6, 1909. Producer No. 4, at McGill University.

Time of lighting up—4.00 a.m. Trial commenced 8.45 a.m. April 5; ended 8.45 a.m. April 6.

Duration of trial—24 hours. Kind of fuel—No. 26 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial	lbs.	950
2.	Moisture in coal as charged	per cent.	0·8
3.	Calorific value of coal as charged, per lb	B.T.U.	13370
4.	" " of dry coal per lb	B.T.U.	13480
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 62·7; volatile matter, 25·6; ash, 10·9; moisture, 0·8	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 33·4; volatile matter, 6·1	Total per cent.	39·5
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43·8

Gas.

8.	Total gas produced during trial (from meter readings)	cub. ft.	93100
9.	Average temperature of gas leaving producer	°F.	72·5
10.	" " " at meter	°F.	67·5
11.	Average temperature of air in producer house	°F.	68·0
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	100·2
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	103·6
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	95·2
14.	Average barometric pressure	lbs. sq in.	14·55
15.	" suction at producer	ins. of water	1·1
16.	" suction at exhauster	ins. of water	8·1
17.	" pressure of gas at meter	ins. of water	5·37

Steam, Water, Etc.

18.	Total steam used in producer during trial	lbs.	2640
19.	" water used in scrubber and gas washer	lbs.	34070
20.	" tar extracted in scrubber and gas washer	lbs.	24
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

Engine.

23.	Total revolutions during trial (from counter)		318740
24.	Average explosions per minute		104·0
25.	Average effective load on brake	lbs	160
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	57·85

28. **Notes.**

Fire poked at: 8.50, 10.55 a.m.; 2.55, 7.00, 9.25 p.m.; 3.10, 7.45 a.m.
Refuse removed at: 12.00 a.m.; 7.15, 9.35 p.m.; 12.40, 3.20, 4.30, 5.00 a.m.
Behaviour of coal: Works well, giving no trouble.
Average time between poking: 3 hours, 26 minutes.
Clinker: Slight tendency to clinker around side of producer.
Tar: Very little.
State of engine valves at end of trial: Did not need cleaning.
Valves last cleaned: March 30, 1909.

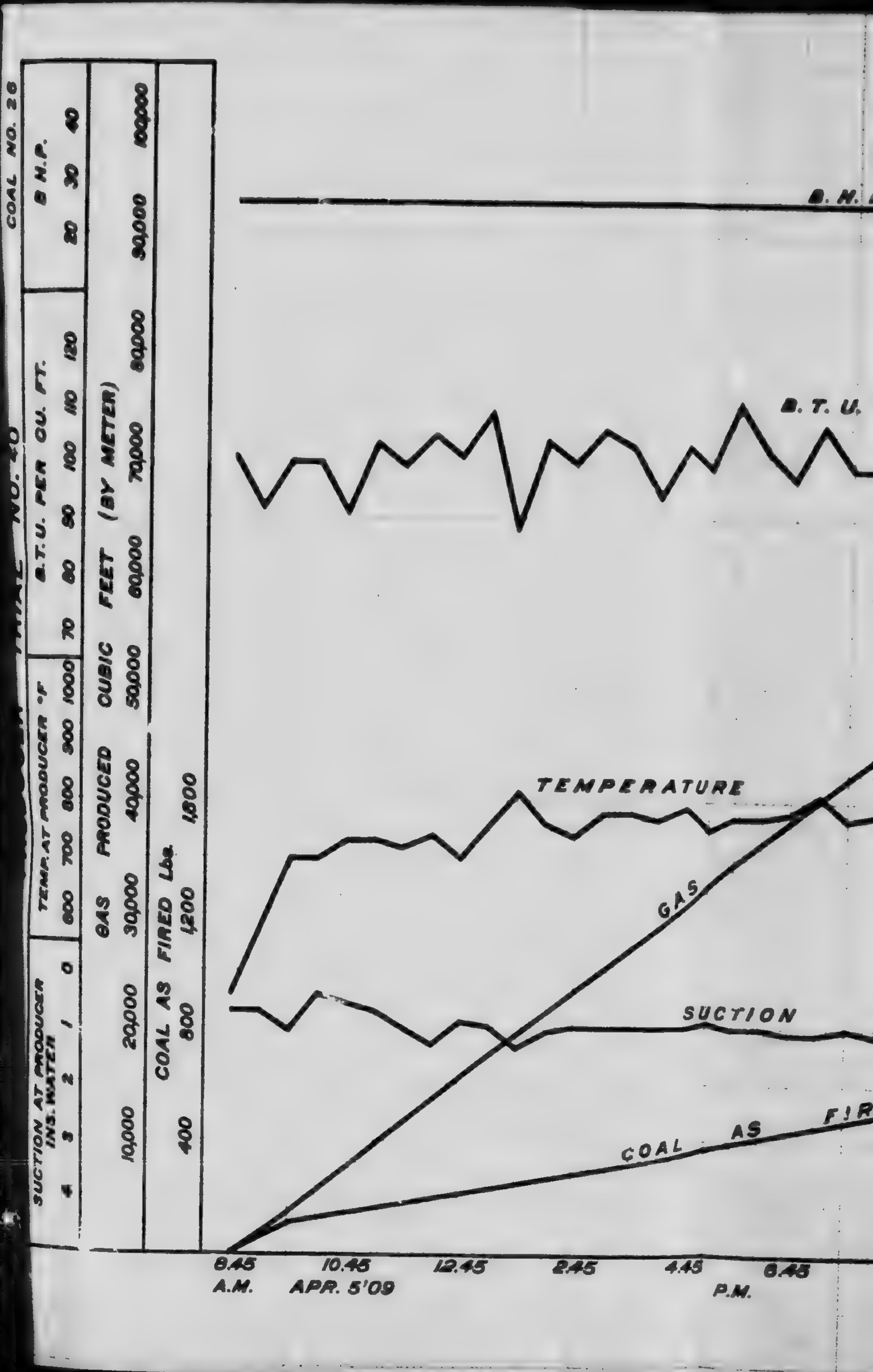
29. Analysis of Dry Coal.

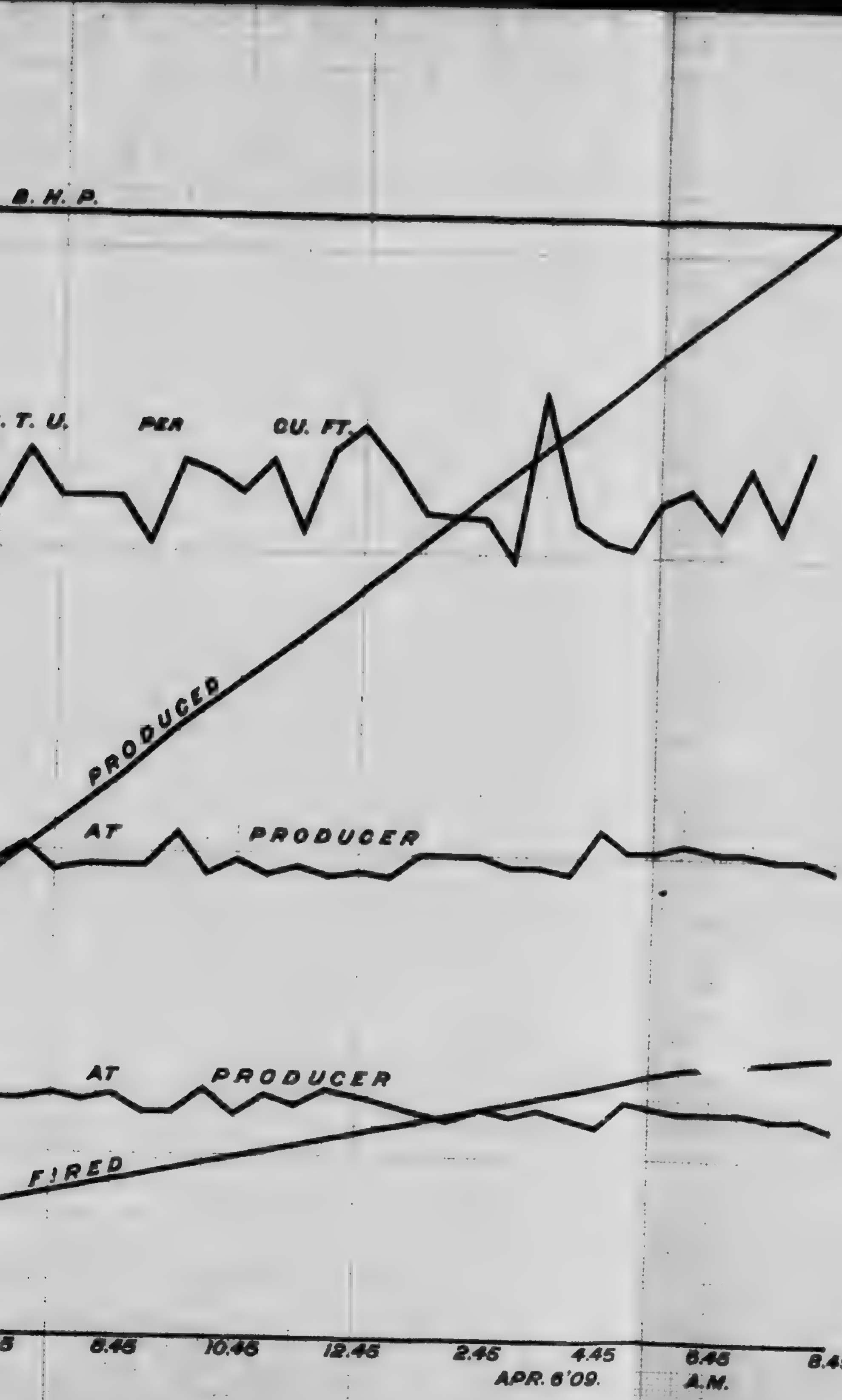
Hydrogen	4·4%
Carbon	77·1%
Nitrogen	1·3%
Oxygen	5·9%
Sulphur	0·5%
Total carbon contained by dry coal charged	726·0 lbs.

30. Analysis of Gas by Volume.

Carbon dioxide	12·9%
Oxygen	0·5%
Carbon monoxide	11·6%
Hydrogen	12·0%
Methane	2·2%
Ethylene	0·0%
Nitrogen	60·8%

PRODUCER TRIAL NO. 40 COAL NO. 26


COAL NO. 26
TRIAL NO. 40
B.H.P.
20 30 40
B.T.U. PER CU. FT.
70 80 90 100 110 120
TEMP. AT PRODUCER °F
600 700 800 900 1000
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1200 1600
B. H.
B. T. U.
TEMPERATURE
GAS
SUCTION
COAL AS FIR
8.45 A.M.
10.45 APR. 5'09
12.45
2.45
4.45 P.M.
6.45



APPENDIX III VOL.V

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Remarks.

This seemed an excellent coal for producer work. The calorific value of the gas was very steady. The coal consumption was low and the producer required little attention.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial	lbs.	942
32.	Combustible charged during trial	lbs.	839
33.	Average B.H.P. of engine during trial	H.P.	25·84
34.	“ indicated H.P. of engine during trial	H.P.	34·41
35.	“ H.P. taken by exhauster and gas washer	H.P.	4·0
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	25·84
37.	“ “ corresponding to total gas produced	H.P.	25·84
38.	“ “ “ “ “ and available for outside use, allowing for power used	H.P.	21·84

Hourly Quantities.

39.	Coal charged per hour	lbs.	39·6
40.	Dry coal charged per hour	lbs.	39·2
41.	Combustible charged per hour	lbs.	35·0
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	9·9
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	9·8
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	8·7
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	6·12
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	13·7
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3880
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3750
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3880
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3750
51.	Calorific value of coal charged per hour	B.T.U.	529000
52.	“ “ gas produced per hour (lower value)	B.T.U.	356500
53.	Steam used in producer per hour	lbs.	110

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	94·7
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	95·7
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	107·1
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	108·9
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	145·2
59.	Steam used in producer per lb. coal charged	lbs.	2·78
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	35·9
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	366·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	67·6
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	57·2
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	42·3
65.	Thermal efficiency of engine, based on B.H.P	per cent.	18·4
66.	Over all efficiency of producer and engine plant	per cent.	12·44
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13820
68.	“ “ coal charged into producer per B.H.P. per hr.	B.T.U.	20456

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·53	1·52	1·35
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	1·81	1·79	1·60
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·44	2·42	2·15

TRIAL OF No. 4 PRODUCER WITH COALS Nos. 27 and 30.

OBSERVATIONS OF GENERAL CONDITIONS.

Date—April 13, 1909. FIRST DAY'S RUN. Trial Number—42

General Notes.

Barometer at beginning of day's run	29·80 inches.
" " end of day's run	29·60 "
No. 27 coal only used during the day.	
Water for the 10 hours run	13,900 lbs.
Brick in producer base	890 "
Average level of coal below the top plate of the producer	26.9 inches.

TIME.	
3.50 a.m.	Fire started with 10 lbs. of shavings, 40 lbs. of wood, 70 lbs. of coke, 100 lbs. of coal.
5.30 "	On down-draft with fan exhausting directly to the atmosphere.
5.40 "	Charged 100 lbs. of coal.
6.15 "	" 50 " "
6.50 "	" 75 " "
7.30 "	" 50 " "
8.05 "	On down-draft with exhauster.
8.15 "	Charged 25 lbs. coal.
8.15 "	Started engine.
8.20 "	Started trial.
6.20 p.m.	Finished trial.

Producer banked with 100 lbs. of coal.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 13, 1909. Trial Number—42.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 a.m.	9·9	0·5	0·2	11·3	3·2	11·7	63·2	26·4
10.20 "	11·2	0·5	0·0	12·4	2·0	9·0	64·9	23·4
11.35 "	14·7	0·5	0·0	10·2	2·4	13·4	58·8	26·0
4.45 p.m.	12·5	0·5	0·0	11·6	2·1	12·5	60·8	26·2

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 13, 1909. Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 20 a.m. ..	3274210	....	N.B.O.	275	105	170	70901
8.50 " ..	3275880	1670	"	275	105	170	....
9 20 " ..	3277930	2050	"	275	105	170	....
9.50 " ..	3279950	2020	"	275	105	170	....
10 20 "	3282030	2080	"	275	105	170	....
10 50 " .	3283980	1950	"	275	105	170	....
11.20 " ..	3286090	2110	"	275	110	165	....
11 50 " .	3287850	1760	"	275	110	165	....
12 20 p m..	3289880	2030	"	275	110	165	....
12.50 " .	3291940	2060	"	275	110	165	....
1 20 " ..	3294000	2060	"	275	110	165	....
1 50 "	3296080	2080	"	275	110	165	....
2.20 " ..	3297940	1860	"	275	110	165	10600
2.50 " .	3299840	1900	"	275	110	165	....
3 20 " ..	3302040	2200	"	275	110	165	....
3 50 " ..	3304110	2070	"	275	110	165	....
4 20 " ..	3305970	1860	"	275	110	165	. .
4 50 " ..	3308020	2050	"	275	110	165	....
5 20 " ..	3310100	2080	"	275	110	165	....
5.50 " ..	3312070	1970	"	275	110	165	.....
6 20 " ..	3313960	1890	"	275	110	165	36760

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED

Date—April 13, 1909. Trial Number—42.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.20 a.m...	55	⅔	6·01	16·65	1730	109·5	8.20 a.m.			
8.50 " ..	58	¾	4·96	13·97	1770	94·8	8.40 "	25	25	9.00 a.m.
9.20 " ..	60	5/12	5·30	11·01	1945	105·5	9.15 "	50	75	
9.50 " ..	61	⅔	5·58	13·37	1980	91·6	10.15 "	50	125	10.45 "
10.20 " ..	63	¾	5·32	16·20	1760	101·1	11.15 "	50	175	
10.50 " ..	65	¾	5·47	15·83	1760	96·2	12.45 p.m.	50	225	
11.20 " ..	66	¾	5·80	16·62	1795	102·5	2.00 "	50	275	
11.50 " ..	67	¾	5·67	15·87	1785	96·0	3.15 "	50	325	3.15 p.m.
12.20 p.m. .	68	⅔	6·04	15·26	1750	95·8	4.00 "	50	375	
12.50 " ..	69	7/12	6·21	15·96	1600	106·0	5.15 "	50	425	
1.20 " ..	71	⅔	6·67	16·[illegible]	1600	96·9				
1.50 " ..	73	¾	7·11	[illegible]	[illegible]50	92·2				
2.20 " ..	73	¾	7·40	[illegible]	[illegible]	103·7				
2.50 " ..	74	⅔	7·46	[illegible]	[illegible]	92·5				
3.20 " ..	75	⅔	7·60	16·[illegible]	[illegible]85	90·8				
3.50 " ..	75	⅔	7·40	16·67	1645	90·7				
4.20 " ..	75	⅔	7·27	16·27	1690	90·4				
4.50 " ..	75	⅔	7·33	16·27	1750	93·0				
5.20 " ..	75	⅔	7·25	16·22	1790	95·5				
5.50 " ..	75	⅔	7·20	15·60	1815	90·5				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 13, 1909. Trial Number—42 (1st day.)

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.20 a.m.	540	57	56	120	3·4	5·3	5·7	5·8	2·5	1·0	68	64
8 50 “	650	58	60	155	3·6	5·2	5·4	7·4	2·8	0·9	66	62
9.20 “	740	61	65	132	4·1	7·0	7·2	10·6	3·3	1·1	72	67
9.50 “	740	64	68	141	3·8	5·8	6·0	8·5	3·2	0·7	54	49
10.20 “	800	66	68	126	4·2	6·5	6·7	10·3	3·7	1·2	63	56
10.50 “	810	68	70	129	4·0	6·1	6·3	9·8	3·3	1·2	55	50
11 20 “	810	69	70	133	3·7	5·0	5·2	7·4	2·9	0·8	62	55
11 50 “	810	70	72	133	4·0	6·0	6·2	9·4	3·7	1·0	69	62
12.20 p.m.	820	71	74	138	4·0	6·1	6·3	9·4	3·7	1·1	71	65
12 50 “	830	72	74	135	3·9	6·0	6·2	9·4	3·8	1·1	72	66
1.20 “	830	72	76	135	4·2	6·5	6·7	9·3	3·4	1·1	74	68
1 50 “	810	72	76	135	4·0	5·4	5·6	8·4	3·6	1·0	72	65
2 20 “	830	74	78	142	3·9	5·9	6·1	8·7	3·3	1·0	70	64
2.50 “	830	74	79	140	4·0	6·1	6·3	9·2	3·3	1·2	68	61
3 20 “	860	74	79	133	4·4	6·3	6·5	9·4	3·4	1·2	70	63
3 50 “	810	76	80	137	4·0	5·5	5·7	8·5	3·3	1·1	71	65
4 20 “	810	75	78	135	3·9	5·2	5·4	8·7	3·5	1·2	65	59
4 50 “	830	75	75	140	4·0	5·8	6·0	9·9	3·7	1·2	72	66
5 20 “	830	75	75	134	4·1	6·0	6·2	10·2	3·8	1·4	70	65
5.50 “	810	75	75	141	3·8	5·0	5·2	8·3	3·5	1·3	71	65
6 20 “	800	75	74	140	3·9	5·3	5·5	8·5	3·4	1·3	55	49

OBSERVATIONS OF GENERAL CONDITIONS.

SECOND DAY'S RUN

Date—April 14, 1909.

Trial Number—42

General Notes.

Barometer at beginning of day's run	29·88 inches
" " end of day's run	30·07 "
No. 27 coal only used during the day	
Average level of coal below the top plate of the producer	20·3 inches
Total water for the 10 hours	12,450 lbs.

TIME.					
6.55	a.m.	Charged	50	lbs	of coal.
7.25	"	"	50	"	"
8.10	"	"	50	"	"
8.25	"	"	50	"	"
8.30	"	Started trial.			
6.30	p.m.	Finished trial.			

The gas washer was steamed both before and after the day's run.
Only a small trace of tar from wet scrubber.
Banked fire with 200 lbs. of coal.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 14, 1909.

Trial Number—42.

Note: R. and B. apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.30 a.m.	14·5	0·6	0·2	10·2	1·9	16·6	56·0	28·9
1.35 "	15·5	0·4	0·0	10·8	2·0	15·2	56·1	28·0
5.10 p.m.	13·9	0·5	0·0	11·8	2·4	13·6	57·8	27·8

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 14, 1909.

Trial Number—42, (2nd day.)

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.30 a.m. ..	3314840	....	N.B.O.	275	105	170	38120
9 00 " ..	3316630	1790	"	300	130	170	
9 30 " ..	3318590	1960	"	300	130	170	
10 00 " ..	3320250	1660	"	300	130	170	
10 30 " ..	3322180	1930	"	300	130	170	
11 00 " .	3323900	1720	"	300	130	170	
11 30 " ..	3325980	2080	"	300	130	170	
12 00 p.m. .	3327850	1870	"	300	130	170	
12 30 " .	3329760	1910	"	300	130	170	
1 00 " .	3331730	1970	"	300	130	170	
1 30 " ..	3333680	1950	"	300	130	170	....
2 00 " ..	3335590	1910	"	300	130	170	....
2 30 " ..	3337550	1960	"	300	125	175	74951
3 00 " ..	3339690	2140	"	300	125	175	
3 30 " ..	3341525	1835	"	300	125	175	
4 00 " ..	3343480	1955	"	300	125	175	
4 30 " ..	3345440	1960	"	300	125	175	
5 00 " ..	3347440	2000	"	300	125	175	
5 30 " ..	3349490	2050	"	300	125	175	....
6 00 " ..	3351350	1860	"	300	125	175	....
6 30 " ..	3353330	1980	"	300	125	175	04875

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 14, 1909. Trial Number—42.

Note: Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.30 a.m. ..	62	$\frac{2}{3}$	14·77	4·42	1705	104·9	8.30 a.m.	....	....	....
9.00 " ..	62	$\frac{2}{3}$	13·88	4·58	1725	95·4	9.15 "	50	50	9.30 a.m.
9.30 " ..	62	$\frac{2}{3}$	16·46	5·20	1665	111·5	10.35 "	50	100	....
10.00 " ..	63	$\frac{2}{3}$	15·98	5·63	1620	99·7	12.00 p.m.	50	150	....
10.30 " ..	63	$\frac{2}{3}$	16·36	5·77	1600	100·7	1.25 "	50	200	....
11.00 " ..	64	$\frac{2}{3}$	15·51	5·88	1645	94.2	3 00 "	50	250	3.00 p.m
11.30 " ..	65	$\frac{2}{3}$	16·50	6·03	1620	101·0	4.15 "	50	300	4.15 "
12.00 p.m. ..	66	$\frac{2}{3}$	16·46	6·16	1630	99·8	5.30 "	50	350	5.30 "
12.30 " ..	66	$\frac{2}{3}$	16·55	6·17	1695	104·7				
1.00 " ..	66	$\frac{2}{3}$	15·45	5·91	1710	97·0				
1.30 " ..	67	$\frac{2}{3}$	15·72	6·09	1740	99·6				
2.00 " ..	68	$\frac{2}{3}$	15·43	6·39	1730	92·9				
2.30 " ..	69	$\frac{2}{3}$	15·98	6·55	1725	96·7				
3.00 " ..	70	$\frac{2}{3}$	15·94	6·56	1730	96·4				
3.30 " ..	69	$\frac{2}{3}$	15·81	6·21	1745	99·5				
4.00 " ..	70	$\frac{2}{3}$	15·33	6·27	1790	96·4				
4.30 " ..	70	$\frac{7}{12}$	15·07	6·27	1655	98·9				
5.00 " ..	70	$\frac{7}{12}$	14·44	6·37	1730	94·8				
5.30 " ..	70	$\frac{7}{12}$	15·80	6·32	1720	110·8				
6.00 " ..	72	$\frac{7}{12}$	14·57	6·44	1800	99·5				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 14, 1909.

Trial Number—42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 30 a.m.	520	64	57	90	3·7	5·2	5·4	8·1	3·6	1·0	72	68
9 00 "	680	68	58	136	3·7	5·3	5·5	8·4	3·7	1·0	63	57
9 30 "	630	68	60	144	3·3	4·7	5·7	5·0	2·9	0·6	69	62
10 00 "	700	68	63	137	3·8	5·9	6·1	8·1	3·1	6·9	61	56
10 30 "	720	68	64	138	3·8	6·0	6·2	8·4	3·3	1·0	69	63
11 00 "	740	68	65	135	3·9	6·5	6·7	9·5	3·8	1·1	64	57
11 30 "	760	69	68	138	3·9	6·4	6·6	8·3	3·5	1·1	69	62
12 00 p.m	750	70	69	142	3·7	6·3	6·5	8·4	3·7	1·1	71	64
12 30 "	760	70	70	145	3·8	6·5	6·7	9·5	4·1	1·3	69	63
1 00 "	760	70	70	138	3·8	6·2	6·4	8·8	3·8	1·2	72	65
1 30 "	800	70	70	147	3·9	6·6	6·8	10·4	4·5	1·8	68	59
2 00 "	800	71	72	151	3·8	6·2	6·4	9·2	3·8	1·3	69	61
2 30 "	810	72	72	150	4·2	7·6	7·8	10·8	4·3	1·6	69	62
3 00 "	800	72	74	150	3·8	6·2	6·4	8·8	3·8	1·5	64	57
3 30 "	800	72	72	147	3·9	6·0	6·2	9·1	3·5	1·6	68	61
4·00 "	800	72	72	140	3·8	6·2	6·4	9·6	4·5	2·0	68	61
4 30 "	800	71	72	138	3·9	6·3	6·5	9·6	4·5	1·9	72	65
5 00 "	820	71	72	138	4·1	6·7	6·9	10·4	4·6	1·9	73	67
5 30 "	810	70	72	140	3·8	6·1	6·3	8·9	4·3	1·6	70	63
6.00 "	800	71	74	138	3·8	6·2	6·4	9·4	4·5	1·9	67	60
6 30 "	800	71	73	137	3·7	6·1	6·3	9·2	4·4	1·8	69	62

OBSERVATIONS OF GENERAL CONDITIONS

Date—April 15, 1909. Trial Number—42.

THIRD DAY'S RUN.

General Notes.

Barometer at beginning of day's run	29·95 inches.
" " end of day's run	30·00 "
No. 27 coal only used for day's run.	
Average level of coal below the top plate of the producer	23·4 "
Total water for the day's run	14,440 lbs

Time.

7.00 a.m.	Fan started, and fire worked up with 150 lbs. of coal.
8.15 "	Trial started.
6.15 p.m.	Trial finished.

Very little tar observed at the scrubber or gas washer.
Gas washer steamed at the end of the trial.
Banked fire with 100 lbs of coal, and left producer with as little access of air as possible.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 15, 1909.

Trial Number—42.

Note: R and B apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.30 a.m.	12·8	0·7	0·1	10·4	2·7	15·7	57·6	28·9
1.50 p.m.	13·2	0·5	0·2	11·4	1·9	14·1	58·7	27·6
5.15 "	10·5	0·5	0·1	11·0	2·6	14·8	60·5	28·5

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 15, 1909.

Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 15 a.m.	3354240						
8 45 "	3355960	1720	N.B.O.	300	125	175	05875
9 15 "	3357700	1740	"	300	125	175	
9 45 "	3359340	1640	"	300	125	175	
10 15 "	3361180	1840	"	275	120	155	
10 45 "	3363190	2010	"	300	130	170	
11 15 "	3365200	2010	"	300	130	170	
11 45 "	3367200	2000	"	300	130	170	
12 15 p.m.	3369200	2000	"	300	130	170	
12 45 "	3371200	2000	"	300	130	170	
1 15 "	3373330	2130	"	300	130	170	
1 45 "	3375210	1880	"	300	120	180	
2 15 "	3377090	1880	"	300	120	180	
2 45 "	3379230	2140	"	300	120	180	
3 15 "	3381170	1940	"	300	120	180	
3.45 "	3383240	2070	"	300	120	180	
4.15 "	3385360	2120	"	300	120	180	
4.45 "	3387300	1940	"	300	120	180	
5 15 "	3389260	1960	"	300	120	180	
5.45 "	3391060	1800	"	300	120	180	
6 15 "	3392860	1800	"	300	120	180	69165

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 15, 1909. Trial Number—42

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.15 a.m. . .	58	1	6·06	17·59	1745	119·5	8.15 a.m.	. . .	. . .	. .
8.45 " . .	59	1	5·16	16·86	1715	119·3	9.50 "	50	50	. . .
9.15 " . .	59	1	5·15	16·19	1720	113·0	11.20 "	50	100	9.15 a.m.
9.45 " . .	60	1	5·15	14·69	1720	97·5	12.35 p.m.	50	150	11.20 "
10.15 " . .	60	1	4·92	14·75	1745	101·9	1.40 "	50	200	1.00 p.m.
10.45 " . .	60	1	5.20	15.54	1785	109·7	3.15 "	50	250	
11.15 " . .	60	1	5·44	14·16	1820	94·4	4.30 "	50	300	
11.45 " . .	61	1	5·56	14·48	1880	99·7	5·15 "	50	350	5.45
12.15 p.m. . .	62	1	5·56	15·90	1600	98·3	5·55 "	50	400	. .
12.45 " . .	62	1	5·58	15·39	1630	95·0				
1.15 " . .	63	1	5·79	16·02	1600	97·2				
1.45 " . .	63	1	5·72	16·00	1665	101·8				
2.15 " . .	64	1	5·87	15·03	1655	90·1				
2.45 " . .	65	1	5·88	15·38	1675	94·5				
3.15 " .		1	6·10	16·43	1690	103·7				
3.45 " . .	. .	1	6·20	15·63	1715	96·2				
4.15 " . .	68	1	6·43	15·41	1710	91·3				
4.45 " . .	68	1	6·63	15·70	1675	93·2				
5.15 " . .	68	1	6.61	16·67	1730	103·4				
5.45 " . .	69	1	6.74	16·45	1800	103·8				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 15, 1909. Trial Number—42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 15 a.m.	470	56	52	90	4·0	6·3	6·5	9·3	4·6	2·1	58	51
8 45 "	540	59	58	142	3·6	6·0	6·2	8·5	4·2	1·6	74	67
9 15 "	610	61	60	128	3·6	5·5	5·7	7·7	3·8	1·4	71	65
9 45 "	650	63	63	130	3·6	5·5	5·7	8·0	3·8	1·4	64	58
10 15 "	710	64	60	133	3·8	6·8	7·0	10·3	4·4	2·5	68	62
10 45 "	730	64	62	138	3·8	6·7	6·9	9·4	4·0	1·6	69	63
11 15 "	750	64	62	134	3·9	6·9	7·1	9·8	4·2	1·6	72	66
11 45 "	770	64	63	138	3·8	6·5	6·7	10·0	4·5	2·0	72	65
12 15 pm.	780	64	65	138	3·9	6·6	6·8	10·3	4·6	2·0	69	62
12 45 "	790	65	65	141	3·9	6·7	6·9	10·3	4·8	2·2	71	64
1 15 "	790	65	65	135	4·0	6·5	6·7	8·8	3·4	1·2	55	48
1 45 "	790	66	67	138	3·9	6·3	6·5	9·9	4·0	1·6	57	50
2 15 "	810	66	68	142	4·1	7·2	7·4	10·7	4·5	1·7	61	54
2 45 "	810	66	67	139	3·9	6·5	6·7	8·7	3·7	1·2	70	64
3 15 "	810	66	68	138	3·8	6·5	6·7	9·3	4·6	2·0	69	62
3 45 "	830	66	69	142	4·2	7·5	7·7	11·0	4·7	2·0	72	65
4 15 "	820	68	70	142	3·9	6·7	6·9	9·4	4·0	1·4	71	64
4 45 "	810	68	72	140	3·8	6·5	6·7	9·4	4·2	1·7	72	66
5·15 "	800	69	72	136	3·7	5	6·1	8·2	4·2	1·7	67	61
5 45 "	810	69	74	141	3·9	7·0	7·2	9·7	3·8	1·4	52	46
6 15 "	810	69	73	140	3·8	6·9	7·1	9·5	3·7	1·5	51	44

OBSERVATIONS OF GENERAL CONDITIONS.

Date—April 16, 1909. Trial Number—42.

FOURTH DAY'S RUN.

General Notes.

Barometer at beginning of day's run	30.10 inches.
" " end of day's run	30.05 "
No. 27 coal only used.	
Average level of coal below top plate of the producer	19.1 "
Total water used for the day's run	13,930 lbs.

TIME.

7.15 a.m.	**Fire started with 50 lbs. of coal.**
8.20 "	**Started trial for the day.**
6.20 p.m.	**Finished trial for the day.**

The gas washer was steamed at the end of the day's run.

The fire was banked with 50 lbs. of coal and 50 lbs. of more combustible, part of refuse from last day's run

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 16, 1909. Trial Number—42

Note: B and B apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent	per cent.	per cent	per cent.
9 25 a.m.	12·1	0·7	0·1	10·4	2·7	15·7	57·6	28·9
1 50 p.m.	13·2	0·5	0·2	11·4	1·9	14·1	58·7	27·6
5 10 "	10·5	0·5	0·1	11·0	2·6	14·8	60·5	28·5

OBSERVATIONS OF GAS METER AND B.H.P

Date—April 16, 1909. Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 20 a.m.	3393780			300	130	170	70000
8 50 "	3395520	1740	N.B.O.	300	130	170	
9 20 "	3397450	1930	"	300	135	165	
9 50 "	3399320	1870	"	300	135	165	
10 20 "	3401220	1900	"	300	130	170	
10 50 "	3403300	2080	"	300	130	170	
11 20 "	3405220	1920	"	300	130	170	
11 50 "	3407050	1830	"	300	130	170	
12 20 p.m.	3409020	1970	"	300	130	170	
12 50 "	3411200	2180	"	300	130	170	
1 20 "	3413370	2170	"	300	130	170	
1 50 "	3415400	2030	"	300	130	170	
2 20 "	3417200	1800	"	300	125	175	08970
2 50 "	3419120	1920	"	300	125	175	
3 20 "	3420950	1830	"	300	125	175	
3 50 "	3422970	2020	"	300	125	175	
4 20 "	3425110	2140	"	300	125	175	
4 50 "	3427100	1990	"	300	125	175	
5 20 "	3429250	2150	"	300	125	175	
5 50 "	3431260	2010	"	300	125	175	
6 20 "	3433280	2020	"	300	125	175	34585

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 16, 1909. Trial Number—42.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.20 a.m...	58	$\frac{1}{12}$	4·27	13·19	1820	110·3	8.20 a.m.	......	......	....
8.50 " ..	57	$\frac{1}{12}$	4·09	13·18	1640	101·3	9.30 "	50	50	....
9.20 " ..	58	$\frac{1}{12}$	4.37	13·61	1635	102·5	10.50 "	50	100	....
9.50 " ..	58	$\frac{1}{12}$	4·56	13·12	1700	98·8	12.05 p.m..	50	150	12.25 p.m...
10.20 " ..	63	$\frac{1}{12}$	4·99	13·61	1720	100·8	1.30 "	50	200	....
10.50 " ..	63	$\frac{1}{12}$	4·95	13·74	1690	100·9	2.50 "	50	250	....
11.20 " ..	65	$\frac{1}{12}$	5·12	14·33	1600	100·1	4.15 "	50	300	5.46 "
11.50 " ..	65	$\frac{1}{12}$	4·94	13·74	1630	97·4	5.45 "	50	350	....
12.20 p.m...	67	$\frac{1}{12}$	5·16	14·43	1630	102·7				
12.50 " ..	68	$\frac{1}{12}$	5·27	14·06	1665	99·5				
1.20 " ..	74	$\frac{1}{12}$	5·59	14·44	1660	99·8				
1.50 " ..	71	$\frac{1}{12}$	5·35	14·68	1680	106·5				
2.20 " ..	70	$\frac{1}{12}$	5·18	13·18	1690	91·8				
2.50 " ..	70	$\frac{1}{12}$	5·15	14·17	1710	104·7				
3.20 " ..	71	$\frac{1}{12}$	5·19	14·14	1695	103·0				
3.50 " ..	71	$\frac{1}{12}$	5·25	13·68	1720	98·5				
4.20 "	70	$\frac{1}{12}$	5·31	14·05	1730	102·7				
4.50 " ..	70	$\frac{1}{12}$	5·39	13·85	1750	100·5				
5.20 " ..	71	$\frac{1}{12}$	5·54	14·07	1750	101·3				
5.50 " ..	72	$\frac{1}{12}$	5·82	14·88	1780	109·6				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 16, 1909. Trial Number—42.

Time	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.20 a.m.	460	58	57	70	3·3	5·1	5·3	6·4	3·8	1·3	69	62
8.50 “	640	60	57	158	4·0	7·4	7·6	9·9	3·7	1·3	67	61
9.20 “	680	61	60	150	3·8	7·0	7·2	8·5	3·1	1·0	69	62
9.50 “	690	62	59	158	3·7	7·0	7·2	8·8	3·4	1·2	72	66
10.20 “	710	64	68	153	4·0	8·2	8·4	10·4	4·1	1·5	70	64
10.50 “	740	66	70	145	4·1	8·2	8·4	10·2	4·0	1·5	71	65
11.20 “	720	67	74	130	3·8	7·3	7·5	8·0	3·5	1·1	73	67
11 50 “	740	68	68	128	3·8	7·2	7·4	9·8	4·2	1·8	64	58
12.20 p.m.	740	68	70	132	3·8	7·1	7·3	10·1	4·1	1·4	74	68
12 50 “	760	69	73	148	4·1	8·0	8·2	11·4	4·2	1·9	72	66
1.20 “	760	70	74	147	4·0	7·8	8·0	10·1	3·7	1·4	71	65
1.50 “	760	72	76	147	3·8	6·9	7·1	8·4	3·7	1·4	72	66
2.20 “	770	73	74	149	4·0	7·4	7·6	10·4	4·1	1·6	71	65
2.50 “	780	73	73	143	3·7	6·4	6·6	8·4	3·9	1·6	72	64
3 20 “	780	73	73	140	3·8	6·7	6·9	9·3	4·0	1·6	67	60
3 50 “	810	71	73	145	4·1	7·6	7·8	11·5	4·7	2·2	65	58
4.20 “	790	72	72	144	3·9	6·5	6·7	9·4	4·3	1·8	70	63
4 50 “	820	73	74	148	4·2	7·6	7·8	11·2	4·5	2·0	71	64
5.20 “	820	73	72	150	4·0	7·0	7·2	8·6	4·1	1·7	65	58
5 50 “	830	73	74	150	4·3	7·6	7·8	11·9	5·7	3·0	62	55
6.20 “	830	74	74	149	4·0	7·2	7·4	8·0	5·0	2·7	65	58

OBSERVATIONS OF GENERAL CONDITIONS.

Date—April 17, 1909. **Trial Number—42**

FIFTH DAY'S RUN.

General Notes.

Barometer at beginning of day's run	29·78 inches.
" " end of day's run	29·90 "

Coal No. 27 only used.

Average level of fuel below top plate of producer	24·7 "
Total water used for day's run	11,420 lbs

Time.		
7.00	a.m.	Fire on down-draft with fan, 50 lbs. of coal charged.
8.00	"	Blower started.
8.15	"	Trial started.
4.30	p.m.	75 lbs. of refuse fired.
6.15	"	Trial finished.

No gas washer was used during the day, the gas being passed through the sawdust scrubber.

Fire banked at the end of the day's run with 100 lbs. of combustible part of refuse.

Sunday, April 18—25 lbs. of combustible refuse from previous day, and 50 lbs. of coal were fired Fire kept banked until Monday morning, April 19

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 17, 1909. Trial Number 42

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.20 a.m.....	12·0	0·4	0·2	13·0	1·9	14·7	57·8	29·8
2.35 p.m.....	13·6	0·2	0·1	11·3	2·0	13·4	59·4	26·8

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 17, 1909. Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 15 a.m.	3433980		N.B.O.	300	120	180	35345
8 45 "	3435890	1910	"	300	120	180	
9 15 "	3437970	2080	"	300	120	180	
9 45 "	3439900	1930	"	300	120	180	
10 15 "	3442030	2130	"	300	120	180	
10 45 "	3443950	1920	"	300	120	180	
11 15 "	3446080	2130	"	300	120	180	
11 45 "	3448010	1930	"	300	120	180	
12 15 p.m.	3449850	1840	"	300	120	180	60865
12 45 "	3451850	2000	"	300	120	180	
1 15 "	3453820	1970	"	300	120	180	
1 45 "	3455800	1980	"	300	120	180	
2 15 "	3457880	2080	"	300	120	180	
2 45 "	3459775	1895	"	300	120	180	
3 15 "	3461930	2155	"	300	120	180	
3 45 "	3463850	1920	"	300	120	180	
4 15 "	3465780	1930	"	300	120	180	86765
4 45 "	3467650	1870	"	300	120	180	
5 15 "	3469530	1880	"	300	120	180	
5 45 "	3471620	2090	"	300	120	180	
6 15 "	3473690	2070	"	300	120	180	98965

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 17, 1909. Trial Number—42

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.15 a.m.	63	3/4	10·62	21·75	1620	95·2	8.15 a.m.	....	....	
8.45 "	64	3/4	6·98	17·64	1600	90·0	8.30 "	50	50	
9.15 "	64	3/4	6·25	16·63	1770	97·0	9.30 "	50	100	
9.45 "	65	2/3	6·35	16·01	1610	92·5	10.50 "	50	150	
10.15 "	65	2/3	6·25	16·11	1660	97·2	12.00 p.m.	50	200	
10.45 "	65	2/3	6·49	15·82	1695	94·0	1.00 "	50	250	1.00 p.m
11 15 "	65	2/3	6·39	15·81	1745	97·7	2.00 "	50	300	2 00
11.45 "	64	2/3	6·32	15·33	1760	94·2	3.00 "	50	350	
12.15 p.m.	64	2/3	6·57	14·82	1775	87·0	4 00 "	50	400	4 00
12.45 "	65	2/3	6·88	15·73	1820	95·7	5.10 "	50	450	
1.15 "	68	3/4	7·93	17·83	1765	92·2				
1.45 "	69	3/4	7·84	18·12	1745	94·8				
2.15 "	69	3/4	7·60	18·11	1775	98·5				
2.45 "	69	2/3	7·54	17·46	1640	96·5				
3.15 "	70	2/3	7·60	17·99	1640	100·2				
3.45 "	70	2/3	7·57	17·10	1670	94·5				
4 15 "	70	2/3	7·71	16·43	1700	88·1				
4.45 "	70	2/3	7·56	16·43	1755	92·5				
5.15 "	70	7/12	7·17	16·07	1600	96·8				
5 45 "	70	7/12	7·25	15·37	1670	92·1				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 17, 1909. Trial Number—42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 15 a.m.	450	62	60	90	3·8	5·5	5·7	9·1	The gas washer was not used.	2·0	62	56
8 45 "	660	64	65	148	3·8	5·9	6·1	9·5		2·0	64	58
9.15 "	720	64	65	142	3·9	5·7	5·9	9·7		1·8	74	68
9 45 "	740	66	67	144	3·6	5·0	5·2	8·0		1·7	63	56
10.15 "	760	66	67	125	4·0	5·5	5·7	8·8		1·7	66	61
10 45 "	760	67	67	175	3·8	4·8	5·0	9·2		2·0	66	60
11 15 "	820	68	67	129	4·0	6·2	6·4	7·7		1·4	62	55
11 45 "	770	68	66	130	3·5	4·5	4·7	7·1		1·0	53	46
12 15 p.m	800	68	66	130	3·9	5·3	5·5	8·4		1·7	61	54
12 45 "	810	68	67	128	3·8	5·0	5·2	9·0		2·0	69	62
1 15 "	830	70	73	130	4·4	7·3	7·5	10·3		2·2	72	65
1 45 "	810	72	75	135	4·2	6·2	6·4	9·1		1·8	75	68
2 15 "	800	72	74	136	3·8	4·9	5·1	7·7		1·1	71	65
2 45 "	810	72	74	140	4·2	6·4	6·6	10·1		2·3	71	64
3 15 "	790	72	74	135	3·7	4·5	4·7	6·8		1·2	64	57
3 45 "	820	72	73	132	4·0	5·3	5·5	8·0		1·2	72	65
4 15 "	820	73	73	138	3·7	6·0	6·2	7·6		1·3	71	63
4 45 "	760	73	73	126	3.6	5·7	5·9	7·0		1·1	74	70
5 15 "	760	73	72	128	3·6	5·8	6·0	7·6		1·3	73	68
5 45 "	810	73	71	135	4·6	7·2	7·4	9·9		2·2	73	69
6 15 "	800	73	70	134	4·2	7·0	7·2	8·8		2·0	72	68

OBSERVATIONS OF GENERAL CONDITIONS.

Date—April 19, 1909. Trial Number 42

SIXTH DAY'S RUN.

General Notes.

Barometer at beginning of day's run	29·60 inches
" " end of day's run	29·60 "
Coal No. 27 only used.	
Average level of fuel below the top plate of the producer	24·9 "
Total water used	10,525 lbs.

Time.		
7.00	a.m.	Fan on with up-draft.
7.40	"	Fan changed over to a down-draft.
7.45	"	50 lbs. of coal charged.
8.30	"	25 lbs. of coal charged.
8.45	"	Trial started.
6.45	p.m.	Trial finished.

The sawdust scrubber was used instead of the gas washer. Length of time before starting, due to having been banked, 36 hours.

Fire banked for the night with 60 lbs. of combustible refuse.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 19, 1909.

Trial Number—42.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.15 a.m.	10·8	0·7	0·1	11·9	2·1	9·3	65·1	23·4
2.15 p.m..	13·1	0·3	0·1	11·5	1·7	11·5	61·8	24·8
5.20 "	13·7	0·3	0·1	11·1	2·1	13·3	59·4	26·6

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 19, 1909.

Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 45 a.m. ..	3476400	....	N.B.O.				
9 15 " ..	3478280	1880	"	275	105	170	01345
9 45 " .	3480390	2110	"	275	105	170	......
10 15 " .	3482260	1870	"	275	105	170	
10 45 " ..	3484410	2150	"	275	105	170	
11 15 " ..	3486420	2010	"	275	105	170	14500
11 45 " .	3488560	2140	"	275	105	170	
12 15 p.m. ..	3490590	2030	"	275	105	170	
12 45 " ..	3492670	2080	"	275	105	170	
1 15 "	3494900	2230	"	275	105	170	
1 45 " .	3496790	1890	"	275	105	170	
2.15 " ..	3498880	2090	"	275	105	170	
2 45 " ..	3501070	2190	"	275	105	170	
3 15 "	3503020	1950	"	275	105	170	40201
3.45 " ..	3505000	1980	"	275	105	170	.....
4 15 " .	3507160	2160	"	275	100	175	......
4 45 " ..	3509170	2010	"	275	100	175	....
5.15 " .	3511320	2150	"	275	100	175	....
5.45 " ..	3513350	2030	"	275	100	175	....
6 15 " ..	3515360	2010	"	275	100	175	....
6.45 " ..	3517420	2060	"	275	100	175	66720

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 19, 1909. **Trial Number—42.**

Note: Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.45 a.m. . .	62	⅔	6·05	16·67	1650	96·6	9.00 a.m.	50	50	. . . .
9.15 " . .	62	⅔	7·25	15·81	1780	90·5	9.45 "	50	100	9.30 a.m. .
9.45 " . .	62	7/12	6·61	15·37	1625	96·7	11.00 "	50	150	10 30 "
10.15 " . .	62	7/12	6·43	14·07	1700	88·2	12.15 p.m. .	50	200	. . . . .
10.45 " .	62	⅔	6·14	15·50	1690	94·0	1.30 "	50	250	2 20 p.m. .
11.15 " . .	63	⅔	6·20	15·86	1660	95·3	2.50 "	50	300	. . . .
11.45 " . .	63	⅔	6·39	15·96	1650	93·8	4.00 "	50	350	5.15 "
12.15 p.m. . .	63	⅔	6·41	15·20	1700	88·8	5.15 "	50	400	. . . . . .
12.45 " . .	63	⅔	6·62	15·58	1710	91·1	6.15 "	50	450	6.15 "
1.15 " . .	63	⅔	6·61	15·54	1710	90·7				
1.45 " . .	63	⅔	6·48	14·91	1710	85·7				
2 15 " . .	63	⅔	6·59	14·59	1740	82·7				
2.45 " . .	63	⅔	6·70	15·34	1740	89·3				
3.15 " . .	63	⅔	6·75	15·97	1755	96·3				
3.45 " . .	63	⅔	6·90	15·76	1780	93·7				
4 15 " . .	63	⅔	7·09	16·27	1760	96·0				
4.45 " . .	64	⅔	6·97	15·68	1750	90·6				
5.15 " . .	65	⅔	7·14	16·64	1730	97·8				
5 45 " . .	65	⅔	7·41	16·35	1730	92·0				
6 15 " . .	66	⅔	7·60	15·99	1735	86·5				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 19, 1909.

Trial Number—42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 45 a.m.	450	62	64	90	4·2	8·8	9·0	11·0	The gas washer was not used.	1·2		
9.15 "	500	64	67	150	3·7	6·5	6·7	11·0		2·8	71	66
9 45 "	680	64	65	146	4·3	8·4	8·6	11·0		1·9	70	65
10 15 "	720	64	63	128	[illegible]	6·5	6·7	8·4		1·8	72	65
10 45 "	790	64	63	130	4·2	7·9	8·1	10·8		1·8	69	62
11 15 "	810	65	64	133	4·3	8·5	8·7	11·0		1·9	68	62
11 45 "	810	65	65	135	4·0	7·3	7·5	9·6		1·4	70	64
12.15 p.m.	810	65	66	137	3·9	7·2	7·4	9·9		1·7	61	55
12 45 "	820	66	65	138	4·1	7·9	8·1	10·4		1·7	68	61
1 15 "	830	65	65	133	4·0	7·3	7·5	10·0		2·4	70	64
1.45 "	820	64	63	135	3·6	6·0	6·2	8·4		1·3	66	60
2.15 "	850	64	63	136	4·4	9·0	9·2	11·9		2·5	72	65
2.45 "	840	64	63	138	4·0	7·4	7·6	8·8		1·2	72	66
3.15 "	830	65	64	137	3·8	7·0	7·2	9·0		1·4	67	60
3 45 "	850	66	64	139	4·2	8·6	8·8	11·0		2·0	69	63
4.15 "	860	67	66	140	3·9	6·7	6·9	8·7		1·4	66	58
4 45 "	900	67	66	140	4·6	9·5	9·7	11·1		2·5	59	52
5 15 "	880	67	67	143	3·8	7·2	7·4	9·3		1·5	69	62
5.45 "	870	67	67	146	4·0	7·3	7·5	9·5		1·7	70	63
6.15 "	870	67	67	146	4·6	7·4	7·6	9·8		2·5	70	63
6 45 "	870	66	67	145	3·8	7·2	7·4	9·6		2·0	68	62

OBSERVATIONS OF GENERAL CONDITIONS.

Date—April 20, 1909. Trial Number—42

SEVENTH DAY'S RUN.

General Notes.

Barometer at beginning of day's run	29 93 inches
" " end of day's run	29 93 "

Coal No. 27 only used.

Average level of fuel below top plate of producer	24 3 inches
Total water used during day's run	12,425 lbs

Time.

7.00 a.m.	Fire started with 50 lbs. of coal; fan running.
7.50 "	On down-draft with exhauster.
8.00 "	Started trial.
6.00 p.m.	Trial finished.

The gas washer was not used.
Fire banked with 60 lbs. of combustible part of refuse.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 20, 1909.

Trial Number—42.

Note: B. and B. apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9 05 a.m.	12·1	0·3	0·3	11·8	2·4	14·5	58·7	28·9
1 40 p.m. . .	13·6	0·2	0·0	10·1	2·1	8·6	65·4	20·8
5 05 " . . .	12·6	0·4	0·0	11·7	2·0	11·9	61·4	25·6

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 20, 1909.

Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 00 a.m. . .	3518350		N.B.O. .	275	100	175	67400
8 30 " .	3520320	1970	"	275	100	175	
9 00	3522400	2080	"	300	125	175	
9 30 " .	3524480	2080	"	300	130	170	
10 00 " .	3526500	2020	"	300	130	170	
10 30 " .	3528450	1950	"	390	130	170	
11 00 " . .	3530610	2160	"	300	130	170	
11 30	3532660	2050	"	300	125	175	
12 00 p.m. . .	3534590	1930	"	300	125	175	
12 30 " .	3536690	2100	"	300	125	175	
1 00 "	3538830	2140	"	300	125	175	
1 30 "	3540780	1950	"	300	125	175	
2 00 "	3542830	2050	"	300	125	175	
2 30 "	3544800	1970	"	300	120	180	
3 00 "	3546860	2060	"	300	120	180	
3 30 "	3548640	1780	"	300	120	180	
4 00 "	3550900	2260	"	300	120	180	
4 30 "	3553120	2220	"	300	120	180	
5 00 "	3554900	1780	"	300	120	180	
5 30 "	3557080	2180	"	300	120	180	
6 00 "	3558940	1860	"	300	120	180	33481

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 20, 1909. **Trial Number—42**

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.00 a.m.	60	$\frac{3}{4}$	10·2	21·46	1700	101·1	8.10 a.m.	50	50	
8.30 "	57	$\frac{3}{4}$	6·22	17·45	1630	96·5	9.35 "	50	100	
9.00 "	60	$\frac{3}{4}$	6·03	18·08	1660	105·5	10.50 "	50	150	10.40 a.m
9.30 "	60	$\frac{3}{4}$	6·00	17·03	1650	96·0	12.00 p.m.	50	200	
10.00 "	62	$\frac{3}{4}$	6·43	17·97	1685	102·7	1.15 "	50	250	
10.30 "	63	$\frac{3}{4}$	6·63	16·50	1740	90·6	2.30 "	50	300	2.45 p.m
11.00 "	63	$\frac{3}{4}$	6·69	17·28	1740	97·2	3.35 "	50	350	
11.30 "	65	$\frac{3}{4}$	6·85	17·78	1755	101·3	4.45 "	50	400	
12.00 p.m.	65	$\frac{3}{4}$	6·93	16·34	1770	87·9	5.40 "	50	450	
12.30 "	66	$\frac{3}{4}$	6·96	16·70	1790	92·0				
1.00 "	67	$\frac{3}{4}$	7·15	16·62	1630	91·7				
1.30 "	67	$\frac{3}{4}$	7·32	17·54	1610	97·8				
2.00 "	68	$\frac{3}{4}$	7·47	16·59	1650	89·4				
2.30 "	68	$\frac{3}{4}$	7·70	17·10	1720	96·1				
3.00 "	69	$\frac{3}{4}$	7·84	1[illegible]·11	1790	98·5				
3.30 "	69	$\frac{7}{12}$	7·80	1[illegible]·12	1600	92·6				
4.00 "	68	$\frac{7}{12}$	7·49	1[illegible]·[illegible]9	1690	97·6				
4.30 "	70	$\frac{7}{12}$	8·00	1[illegible]·[illegible]9	1720	103·9				
5.00 "	70	$\frac{7}{12}$	8·07	15·47	1785	89·7				
5.30 "	72	$\frac{7}{12}$	8·73	16·22	1760	89·6				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 20, 1909.

Trial Number—42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet	Outlet	Inlet.	Gas Washer Inlet	Producer Outlet	Inlet	Outlet.
8 00 a.m	450	58	57	100	3·6	5·1	5·3	7·6	Gas washer was not used	1·7	71	64
8.30 "	640	60	57	155	3·8	6·2	6·4	8·6		1·7	69	62
9 00 "	750	61	62	133	4·0	7·4	7·6	9·5		1·8	70	63
9.30 "	760	62	62	141	3·9	6·8	7·0	8·5		1·5	70	63
10.00 "	810	63	65	141	4·3	8·6	8·8	10·3		2·2	72	65
10 30 "	800	64	67	145	4·6	7·6	7·8	9·8		2·3	68	61
11 00 "	790	65	67	142	3·6	6·6	6·8	7·9		1·2	74	68
11 30 "	800	66	68	141	4·3	8·7	8·9	9·0		1·3	73	66
12 00 p m	820	67	68	143	4·2	8·0	8·2	9·3		1·8	67	61
12 30 "	840	68	69	144	4·2	8·0	8·2	9·0		1·6	69	62
1 00 "	850	69	69	148	4·2	8·1	8·3	9·6		2·0	67	60
1 30 "	800	68	70	147	3·8	6·9	7·1	8·5		1·8	72	65
2 00 "	810	70	70	143	4·0	7·4	7·6	9·[illegible]		2·0	64	58
2 30 "	840	70	71	147	4·4	8·6	8·8	10·7		2·3	71	65
3 00 "	790	71	72	149	3·8	6·6	6·8	8·2		1·2	68	62
3 30 "	820	72	72	149	4·4	8·6	8·8	10·1		1·9	68	61
4 00 "	830	72	67	155	4·2	8·4	8·6	10·1		2·0	70	64
4 30	800	72	72	152	3·9	6·9	7·1	8·0		1·3	68	61
5 00 "	810	72	72	143	4·5	8·6	8·8	10·3		2·2	72	65
5 30 "	810	72	73	145	4·1	7·3	7·5	9·6		2·0	67	60
6 00 "	810	73	74	143	3·9	7·0	7·2	9·0		1·8	65	58

OBSERVATIONS OF GENERAL CONDITIONS.

EIGHTH DAY'S RUN.

Date—April 22, 1909. Trial Number—42.

General Notes.

On April 21, no trial was run, and the fire was banked with 250 lbs. of coal, and 50 lbs. of refuse.
April 22: Coals No. 27 and 30 used.

Barometer at beginning of day's run	29·40 inches
" " end of day's run	29·47 "
Total water used	10,540 lbs.
Average level of fuel below top plate of producer	25·7 inches

Time.

7.00	a.m.	Fan started; 75 lbs. of coal fired.
8.00	"	Blower started.
8.00	"	Trial started.
6.00	p.m.	Trial finished.

Fire had been banked for 36 hours before starting this day's run.
The gas washer was not used.
Fire banked with 50 lbs. of combustible part of refuse.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 22, 1909.

Trial Number—42.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.10 a.m.	12·7	0·3	0·0	13·6	1·9	18·2	53·3	33·7
1.55 p.m.	13·7	0·3	0·0	12·1	2·0	15·7	56·2	29·8
5.10 "	13·4	0·2	0·1	12·2	2·4	10·9	60·8	25·6

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 22, 1909.

Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.15 a.m.	3566620	....	N.B.O.	300	115	185	36915
8 45 "	3568520	1900	"	300	115	185	
9 15 "	3570190	1670	"	300	115	185	
9 45 "	3572260	2070	"	300	115	185	
10.15 "	3574260	2000	"	300	130	170	
10 45 "	3576290	2030	"	300	130	170	
11 15 "	3578180	1890	"	300	135	165	
11 45 "	3580180	2000	"	300	135	165	
12 15 p.m.	3582340	2160	"	325	145	180	
12.45 "	3584410	2070	"	325	145	180	
1 15 "	3586480	2070	"	325	145	180	
1 45 "	3588550	2070	"	325	140	185	
2.15 "	3590430	1880	"	325	140	185	
2 45 "	3592630	2200	"	325	140	185	
3 15 "	3594660	2030	"	325	140	185	
3 45 "	3596620	1960	"	325	135	190	
4 15 "	3598690	2070	"	325	135	190	
4 45 "	3600260	1570	"	300	120	180	
5 15 "	3602380	2120	"	300	115	185	
5 45 "	3604400	2020	"	300	115	185	
6 15 "	3606380	1980	"	300	115	185	01913

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 22, 1909. **Trial Number—42.**

Note: Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.15 a.m...	62	¾	13·11	23·18	1700	90·5	8 15 a.m..	.....	...	
8.45 " ..	63	¾	8·13	19·91	1630	101·4	9.10 "	50	50	
9.15 " ..	63	¾	6·86	17·53	1610	97	10·30 "	50	100	
9.45 " ..	65	¾	7.11	18·68	1600	97·7	11·50 "	50	150	
10.15 " .	65	¾	7·27	16·99	1670	85·6	1.10 p.m.	50	200	12 50 p.m.
10.45 " ..	68	¾	7·70	18·46	1650	93·7	1.45 "	50	250	1.30 "
11.15 " ..	68	¾	7·81	17·93	1640	87·5	3.00 "	50	300	3.45 "
11.45 " ..	69	¾	7·77	17·54	1670	86·1	4.00 "	50	350	
12.15 p.m...	70	¾	[illegible]·04	18·65	1660	93·0	5.00 "	50	400	
12.45 " ..	70	¾	8·00	18·74	1600	90·6	5.45 "	50	450	
1.15 " ..	71	¾	8·24	17·87	1725	87·6				
1.45 " ..	73	¾	8·02	19·03	1695	98·5				
2.15 " ..	73	¾	8·55	18·64	1725	91·8				
2.45 " ..	73	¾	8·35	18·77	1600	99·2				
3.15 " ..	73	¾	8·29	18·58	1610	98·5				
3.45 " ..	73	¾	8·45	19·18	1600	102·0				
4.15 " ..	74	¾	8·50	18·91	1610	99·5				
4.45 " ..	73	¾	8·18	17·27	1600	86·4				
5.15 " ..	73	¾	8·17	18·09	1600	94·3				
5 45 " .	73	¾	8·65	17·88	1600	87·8				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 22, 1909.

Trial Number —42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlt.	Inlet.	Outlet.
8.15 a.m.	530	62	65	100	3·8	6·6	6·8	9·2	The gas washer was not used.	1·0	70	63
8.45 "	590	64	68	133	4·0	7·8	8·0	10·0		1·2	75	70
9.15 "	610	65	67	113	3·4	5·8	6·0	9·6		1·3	72	66
9.45 "	740	66	68	125	4·3	8·1	8·3	10·4		2·0	69	62
10.15 "	740	66	70	133	3·8	6·9	7·1	9·2		1·6	67	60
10.45 "	800	67	72	128	4·4	8·7	8·9	10·7		2·0	69	62
11.15 "	790	68	73	128	4·2	8·2	8·4	10·3		2·0	69	62
11.45 "	760	70	74	128	3·6	6·2	6·4	8·8		1·6	70	64
12.15 p.m.	800	70	74	140	3·9	7·3	7·5	9·5		1·8	74	67
12.45 "	820	71	74	137	3·8	[illegible]	7·5	9·6		1·8	62	55
1.15 "	820	72	75	139	3·9	7·1	7·3	10·0		1·8	72	65
1.45 "	840	72	75	140	3·9	7·2	7·4	10·1		1·8	71	64
2.15 "	830	73	76	148	4·0	7·3	7·5	10·4		2·0	70	63
2.45 "	820	74	77	126	3·6	6·1	6·3	8·7		1·5	73	67
3.15 "	820	74	77	125	3·8	6·9	7·1	9·1		1·3	72	66
3.45 "	820	74	77	129	3·6	6·6	6·8	9·1		1·7	71	63
4.15 "	820	75	78	130	3·6	5·8	6·0	8·4		1·3	73	67
4.45 "	820	74	74	130	4·0	7·7	7·9	10·5		2·0	66	60
5.15 "	810	74	74	145	3·6	5·3	5·5	8·6		[illegible]	66	60
5.45 "	860	74	75	145	4·2	7·9	8·1	10·9		2·0	[illegible]	67
6.15 "	850	74	75	145	4·0	7·6	7·8	9·8		1·7	70	63

OBSERVATIONS OF GENERAL CONDITIONS.

Date—April 23, 1909. NINTH DAY'S RUN. Trial Number—42.

General Notes.

Barometer at beginning of day's run	29·51 inches.
" " end of day's run	29·63 "

Coal No. 30 only charged.

Average level of fuel below top plate of producer	25·1 inches.
Total water used	11,525 lbs.

TIME.	
7.00 a.m.	Fan started; 50 lbs. of coal charged.
7.45 "	Exhauster started.
8.05 "	Started trial.
6.05 p.m.	Finished trial.

The gas washer was not used.
Fire banked with 60 lbs. of combustible refuse. from the day's run.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 23, 1909.

Trial Number—42.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.20 a.m.....	11·1	0·3	0·0	12·9	2·3	11·2	62·2	26·4
1.35 p.m.....	13·5	0·3	0·1	12·8	1·9	13·5	57·9	28·3
5.20 "	12·6	0·3	0·1	12·8	2·0	12·4	59·8	27·3

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 23, 1909.

Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 05 a.m. ..	3607200	......	N.B.O.	300	125	175	02730
8 35 " ..	3609110	1910	"	300	125	175	
9 05 " ..	3610880	1770	"	300	125	175	
9 35 " .	3612960	2080	"	300	125	175	
10 05 " .	3614890	1930	"	300	125	175	
10 35 " ..	3616880	1990	"	300	125	175	
11 05 " ..	3618900	2020	"	300	125	175	
11 35 " .	3620890	1990	"	300	125	175	
12 05 p.m.	3622910	2020	"	300	120	180	
12 35 " .	3624920	2010	"	300	120	180	
1 05 " .	3626490	1570	"	300	120	180	
1 35 "	3628650	2160	"	300	120	180	
2 05 " .	3630410	1760	"	300	120	180	
2 35 "	3622465	2055	"	300	120	180	
3 05 " ..	3634440	1975	"	300	120	180	
3 35 " ..	3636352	1912	"	300	120	180	
4 05 " ..	3638205	1853	"	300	120	180	
4 35 " ..	3640100	1895	"	300	120	180	
5 05 " ..	3641895	1795	"	300	120	180	
5 35 " ..	3693920	2025	"	300	120	180	
6 05 " ..	3645730	1810	"	300	120	190	
				300	120	180	684561

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 23, 1909. Trial Number—42.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.05 a.m..	63	⅔	9·24	19·65	1630	101·0	8.10 a.m..	50	50	....
8 35 " ..	63	⅔	7·10	16·80	1655	95·4	9·10 "	50	100	....
9.05 " ..	63	⅔	6·79	16·00	1660	90·8	10.10 "	50	150	....
9.35 " ..	63	⅔	6·69	16·41	1695	97·9	11·10 "	50	200	....
10.05 " ..	63	⅔	6·71	15·20	1730	87·3	12.10 p.m..	50	250	12.05 p.m.
10.35 " ..	64	⅔	6·76	15·79	1740	93·3	1.20 "	50	300	....
11.05 " ..	64	⅔	6·72	15·15	1780	89·2	2.30 "	50	350	....
11.35 " ..	65	⅔	6·93	14·95	1820	86·7	3.40 "	50	400	......
12.05 " ..	67	⅔	7·22	16·24	1790	96·0	5.00 "	50	450	......
12.35 " ..	68	⅔	7·64	19·01	1600	108·2				
1.05 " ..	68	⅔	7·98	17·23	1600	88·0				
1.35 " ..	69	⅔	8·05	18·83	1630	104·4				
2.05 " ..	70	⅔	8·37	17·84	1630	91·8				
2.35 " ..	70	⅔	7·86	18·15	1630	99·6				
3 05 " ..	69	⅔	7·80	17·45	1620	92·8				
3.35 " ..	70	⅔	7·97	17·99	1620	96·0				
4 05 " ..	69	⅔	7·98	17·92	1640	96·8				
4.35 " ..	69	⅔	8·10	17·90	1670	97·2				
5 05 " ..	70	⅔	8·27	17·56	1690	93·2				
5.35 " ..	70	⅔	8·37	17·59	1680	92·0				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 23, 1909.

Trial Number—42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.05 a.m.	[illegible]70	62	60	95	3·8	7·4	7·6	9·7	The gas washer was not used.	1·0	72	67
8.35 "	660	64	64	135	3·6	6·2	6·4	9·5		1·4	70	62
9.05 "	700	64	64	133	3·7	6·8	7·0	9·8		1·7	72	66
9.35 "	720	65	65	133	3·5	5·9	6·1	9·0		1·7	72	67
10.05 "	770	66	65	134	4·0	7·7	7·9	11·0		2·2	70	64
10.35 "	760	66	67	136	3·6	6·0	6·2	9·6		1·6	72	66
11.05 "	800	67	67	133	3·8	6·8	7·0	9·9		1·7	69	63
11.35 "	830	68	68	135	4·2	8·7	8·9	11·6		2·3	70	64
12.05 p.m.	800	69	72	131	3·6	6·6	6·8	9·3		1·0	66	60
12.35 "	780	70	74	136	3·6	6·4	6·6	9·5		1·8	68	62
1.05 "	760	70	74	135	3·6	6·8	7·0	10·4		2·1	60	52
1.35 "	800	71	74	133	3·6	6·2	6·4	8·9		1·0	68	60
2.05 "	800	71	75	138	3·6	6·1	6·3	9·1		1·2	73	66
2.35 "	800	71	75	130	3·5	5·7	5·9	9·2		1·4	65	57
3.05 "	860	72	73	132	4·2	8·0	8·2	11·3		1·7	75	68
3.35 "	870	71	73	128	3·9	7·0	7·2	10·4		1·8	72	65
4.05 "	810	71	71	133	3·7	6·1	6·3	9·3		1·4	72	65
4.35 "	800	70	71	140	3·7	6·4	6·6	9·3		1·3	68	61
5.05 "	800	71	72	139	3·7	6·3	6·5	9·4		1·3	65	58
5.35 "	840	71	73	141	4·0	7·0	7·2	10·0		1·8	68	61
6.00 "	820	72	73	140	[illegible]	[illegible]	6·2	9·6		1·8	71	64

OBSERVATIONS OF GENERAL CONDITIONS.

Date—April 24, 1909. TENTH DAY'S RUN. Trial Number—42.

General Notes.

Barometer at beginning of day's run .... 29·85 inches.
" " end of day's run .... 29·96 "

Coal No. 30 only used.
Total water used .... 13,350 lbs
Average level of fuel below top plate of producer .... 27·5 inches.

TIME.
7.00 a.m. Fan started; 150 lbs. of coal charged from 7.00 a.m. to 8.15 a.m.
7.55 " Exhauster started.
8.05 " Started engine.
8.15 " Started trial.
1.45 p.m. Sawdust scrubber was not used after this. Tank permitted to blow off.
6.15 " Trial finished.

The gas washer was not used.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 24, 1909.

Trial Number—42.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent	per cent.
9.10 a.m.....	11·3	0·2	0·1	12·4	2·0	10·0	64	24·5
2.05 p.m.....	12·3	0·3	0·0	12·4	2·0	9·9	63·1	24·3

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 24, 1909.

Trial Number—42.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 15 a.m.	3646410	....	N.B.O.	300	125	175	69370
8 45 "	3648100	1690	"	300	125	175	...
9 15 "	3650060	1960	"	300	125	175	
9 45 "	3652130	2070	"	300	125	175	
10 15 "	3654100	1970	"	300	125	175	
10 45 "	3655930	1830	"	300	130	170	
11 15 "	3657850	1920	"	300	130	170	
11 45 "	3659870	2020	"	300	130	170	
12 15 p.m.	3661660	1790	"	300	130	170	
12 45 "	3663770	2110	"	300	130	170	
1 15 "	3665780	2010	"	300	125	175	
1 45 "	3668010	2230	"	300	125	175	
2 15 "	3670250	2240	B.O.	300	125	175	
2 45 "	3672420	2170	"	300	125	175	
3 15 "	3674520	2100	"	300	125	175	
3 45 "	3676790	2270	"	300	125	175	
4 15 "	3679150	2360	"	300	125	175	
4 45 "	3681280	2130	N.B.O.	300	125	175	
5 15 "	3683350	2070	"	300	125	175	
5 45 "	3685510	2160	"	300	125	175	
6 15 "	3687250	1740	"	300	125	175	35390

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date —April 24, 1909. Trial Number —12

Time	Gas Temp. °F	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs	lbs	
8.15 a.m.	58	$\frac{1}{12}$	8·72	18·92	1650	1·00	8.15 a.m.			
8.45 "	59	$\frac{1}{12}$	7·73	17·43	1670	96·3	8.20 "	50	50	8.30 a.m.
9.15 "	60	$\frac{1}{12}$	7·78	17·55	1600	92·9	9.20 "	50	100	
9.45 "	62	$\frac{1}{12}$	8·19	17·68	1730	97·5	10.40 "	50	150	
10.15 "	63	$\frac{1}{12}$	7·96	18·36	1700	105·0	11.50 "	50	200	
10.45 "	64	$\frac{1}{12}$	8·00	16·93	1800	95·5	12.50 p.m.	50	250	1.30 p.m.
11.15 "	63	$\frac{1}{12}$	7·77	16·36	1770	90·4	2.00 "	50	300	
11.45 "	65	$\frac{1}{12}$	7·97	16·31	1755	87·0	2.40 "	50	350	
12.15 p.m.	67	$\frac{1}{12}$	8·25	16·51	1770	86·8	3.10 "	50	400	
12.45 "	68	$\frac{1}{12}$	8·34	16·07	1810	83·2	4.40 "	50	450	
1.15 "	68	$\frac{1}{12}$	8·54	16·18	1620	84·0	5.40 "	25	475	
1.45 "	69	$\frac{1}{12}$	8·71	17·82	1775	96·0				
2.15 "	70	$\frac{1}{12}$	8·55	16·97	1780	89·0				
2.45 "	70	$\frac{1}{12}$	8·43	18·63	1655	104·4				
3.15 "	70	$\frac{1}{12}$	8·23	18·00	1650	95·8				
3.45 "	70	$\frac{1}{12}$	8·45	18·24	1620	94·2				
4.15 "	70	$\frac{1}{12}$	8·51	17·83	1650	91·5				
4.45 "	70	$\frac{1}{12}$	8·82	18·75	1630	96·2				
5.15 "	70	$\frac{1}{12}$	8·60	18·60	1605	95·2				
5.45 "	71	$\frac{1}{12}$	8·27	19·56	1660	101·5				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 24, 1909.

Trial Number—42.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 15 a.m.	440	60	57	98	3·2	5·0	5·2	9·6	Gas washer not used	1·4	69	62
8 45 "	640	61	60	139	3·7	7·0	7·2	10·8		1·3	70	65
9 15 "	730	62	62	141	3·8	7·0	7·2	11·2		1·5	69	64
9 45 "	750	64	68	146	3·6	6·1	6·3	10·0		1·5	73	68
10 15 "	820	66	68	145	4·0	8·1	8·3	11·0		1·8	69	64
10 45 "	790	67	70	148	3·8	7·9	8·1	11·6		1·8	69	64
11 15 "	760	68	70	150	3·6	5·8	6·0	10·0		1·7	66	61
11 45 "	800	70	70	143	4·2	8·3	8·5	12·0		2·1	68	62
12 15 p.m.	760	72	72	151	3·4	6·0	6·2	9·8		1·6	68	63
12 45 "	800	73	70	147	4·2	8·0	8·2	12·0		2·3	69	63
1 15 "	820	74	74	150	4·0	7·6	7·8	11·8		2·2	72	67
1 45 "	860	74	74	155	4·4	9·2	9·4	9·4		3·2	72	66
2 15 "	860	74	74	153	4·2	8·1	8·3	7·6		2·0	71	65
2 45 "	860	72	74	160	4·0	7·4	7·6	8·5		3·1	71	64
3 15 "	850	70	72	150	4·0	7·1	7·6	8·5		3·3	71	64
3. 45 "	860	70	72	145	4·3	8·6	8·8	9·8		3·9	69	62
4 15 "	860	70	70	156	4·2	7·9	8·4	8·9		3·5	68	62
4 45 "	850	71	73	152	3·6	6·1	6·3	7·6		2·6	70	63
5 15 "	860	70	72	151	4·0	8·0	8·2	8·0		2·5	69	63
5 45 "	880	71	74	150	4·2	7·9	8·1	7·5		2·2	71	65
6 15 "	870	71	74	151	4·0	7·8	8·0	7·4		2·1	70	63

PRODUCER TRIAL No. 42.

Date—April 13-24, 1909. Producer No. 4, at McGill University.
Time of lighting up—3.50 a.m. Trial commenced 8.30 a.m., 13-4-1909; ended 5.45 p.m., 24-4-1909.
Duration of trial—100 hours (10 hours per day). Kind of fuel—Nos. 27 and 30 coal.
Observers and staff during trial—Cameron, Killam, Gardner.
Computers—Cameron, Killam.
Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS

Note.

These figures do not include the coal used for banking and restarting.

FUEL.

1.	Total coal charged during trial	lbs.	4250
2.	Moisture in coal as charged	per cent.	0·97
3.	Calorific value of coal as charged, per lb.	B.T.U.	13580
4.	" " of dry coal per lb.	B.T.U.	13720
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 64·10; volatile matter, 24·82; ash, 9·57; moisture, 0·97	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 60·7; volatile matter, 5·3	Total per cent.	66·0
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	41

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	[illegible]
9.	Average temperature of gas leaving producer	°F.	[illegible]
10.	" " " at meter	°F.	68·4
11.	Average temperature of air in producer house	°F.	69·1
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	95·[illegible]
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	98·9
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	[illegible]
14.	Average barometric pressure	lbs. sq. in.	14·[illegible]
15.	" suction at producer	ins. of water	1[illegible]
16.	" suction at exhauster	ins. of water	[illegible]
17.	" pressure of gas at meter	ins. of water	

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	[illegible]
19.	" water used in scrubber and gas washer	lbs.	121[illegible]
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	
22.	" " " gas washer (used for 4 days of 10 hours)	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		[illegible]
24.	Average explosions per minute		[illegible]
25.	Average effective load on brake	lbs.	171·4
26.	Effective radius of brake wheel	ft.	5·8[illegible]
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	66·5

28. **Notes.**

Fire poked at: About 3 or 4 times in each 10 hours.
Behaviour of coal: No difficulty in using these coals.
Average time between poking:
Clinker: Gave no trouble.
Tar: Gave no trouble.
State of engine valves at end of trial: Perfectly free.
Valves last cleaned: March 30, 1909.

29. ANALYSIS OF DRY COAL.

Hydrogen	4·4 %
Carbon	78·65%
Nitrogen	1·20%
Oxygen	5·50%
Sulphur	0·30%
Total carbon contained by dry coal charged	3305·0 lbs.

30. ANALYSIS OF GAS BY VOLUME

Carbon dioxide	12·72%
Oxygen	0·41%
Carbon monoxide	11·74%
Hydrogen	12·95%
Methane	2·21%
Ethylene	0·7 %
Nitrogen	
	59·8 %

REMARKS

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	4207
33.	Average B.H.P. of engine during trial	lbs.	3800
34.	" indicated H.P. of engine during trial	H.P.	27·75
35	" H.P. taken by exhauster and gas washer	H.P.	39·80
36.	" B.H.P. while gas consumption of engine was taken	H.P.	3·4
37.	" " corresponding to total gas produced	H.P.	27·75
38.	" " " " " and	H.P.	27·75
	available for outside use, allowing for power used	H.P.	24·65

HOURLY QUANTITIES

39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	42·5
41	Combustible charged per hour	lbs.	42·1
42	Coal charged per sq. ft. of fuel bed per hour	lbs.	38·0
43	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	10·6
44	Combustible charged per sq. ft. of fuel bed per hour	lbs	10·5
	ged) per hour equivalent to power used for auxiliaries	lbs.	9·5
4.	ed) per hour equivalent to steam used in producer	lbs.	4·7
47	supplied by producer per hour	lbs.	13·43
	and 14·7 lbs. per sq. in supplied by producer per	cub. ft.	3968
	supplied to engine per hour while gas consumption	cub. ft.	3840
	60° and 14·7 lbs. per sq. in.) supplied to engine per	cub. ft.	3968
	gas consumption was taken		
51	of coal charged per hour	cub. ft.	3840
52.	" gas produced per hour (lower value)	B.T.U.	577500
53.	Steam used in producer per hour	B.T.U.	345000
		lbs.	109·4

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	90·4
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	91·3
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr	cub. ft.	101·1
58.	" " " " " " B.H.P. "	cub. ft.	196·5
59.	Steam used in producer per lb. coal charged	cub. ft.	138·3
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	2·57
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	29·3
62.	Efficiency of process of gas production and cleaning, based on coal charged	lbs.	314·0
		per cent.	59·9
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	53·2

64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	40·5
65.	Thermal efficiency of engine, based on B.H.P	per cent.	20·5
66.	Over all efficiency of producer and engine plant	per cent.	12·26
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12420
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	20777

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·53	1·52	1·37
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	1·71	1·70	1·54
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·27	2·26	2·02

THE RESULTS, INCLUDING THE COAL USED FOR BANKING AND RE-STARTING, ARE AS FOLLOWS:—

	Coal used for banking and re-starting	lbs.	1600
1a.	Total coal charged, including the coal used for banking and re-starting	lbs.	5850
62a.	Efficiency of process of gas production and cleaning, based on total coal charged (1a)	per cent.	43·5
63a.	Efficiency of producer plant, allowing for power used by auxiliaries	per cent.	38·7
64a.	Efficiency of producer plant, allowing for power used for auxiliaries and for steam used in producer	per cent.	31·4
66a.	Overall efficiency of producer and engine plant	per cent.	8·9
68a.	Calorific value of coal charged into producer per B.H.P. per hour	B.T.U.	28600

		Coal as charged.	Dry coal.	Combustible.
69a.	Pounds charged into producer per B.H.P. hour developed by the engine	2·11	2·09	1·89
70a.	Pounds charged into producer per B.H.P. hour available for outside use, and allowing for power used by auxiliaries	2·37	2·34	2·12
71a.	Pounds charged into producer per B.H.P. hour, allowing for power and also for steam used by producer	2·92	2·91	2·61

·5
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·26
420
777

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7

4

2

AS

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850

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8·7

1·4
8·9
600

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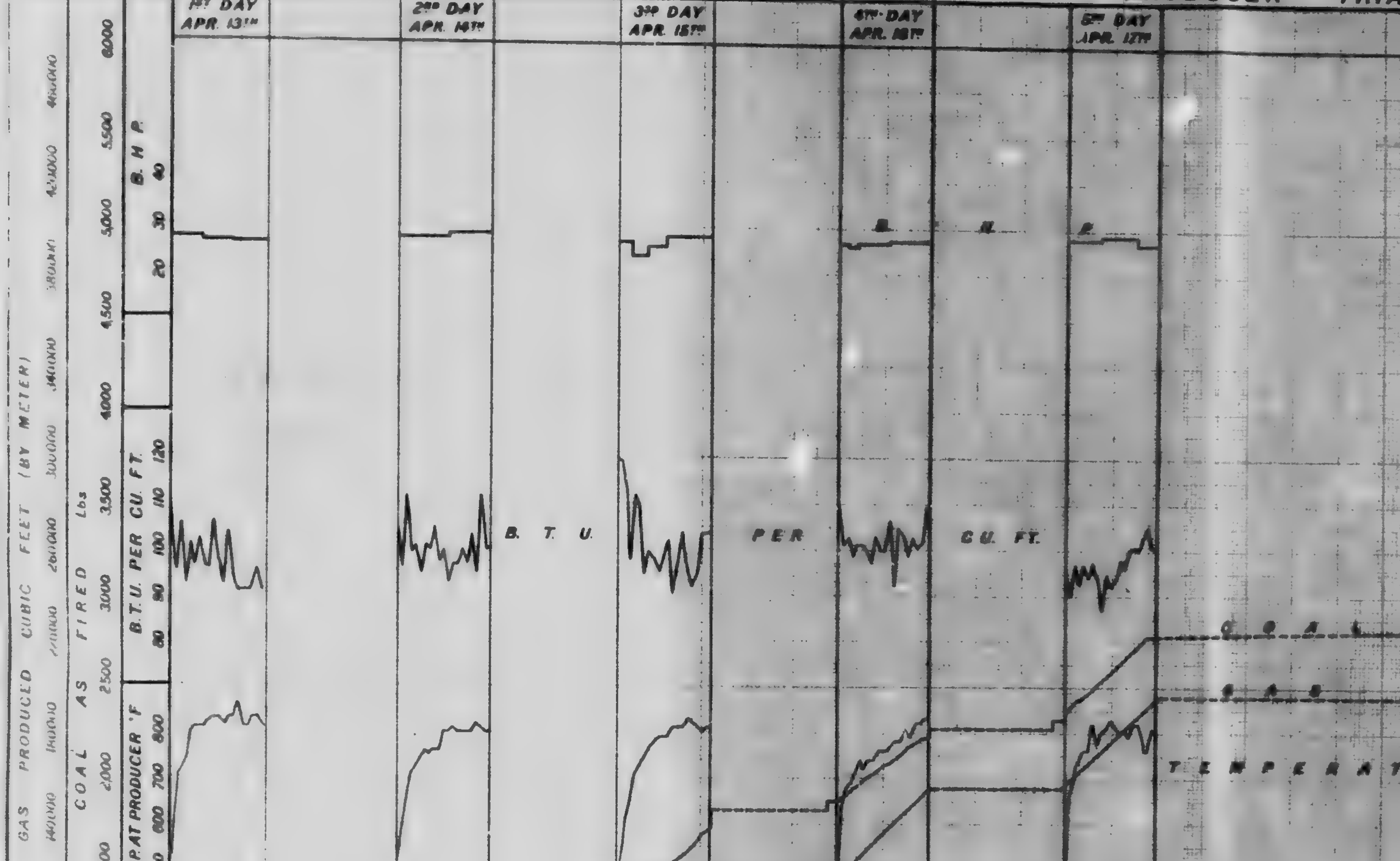
ble.

9

2

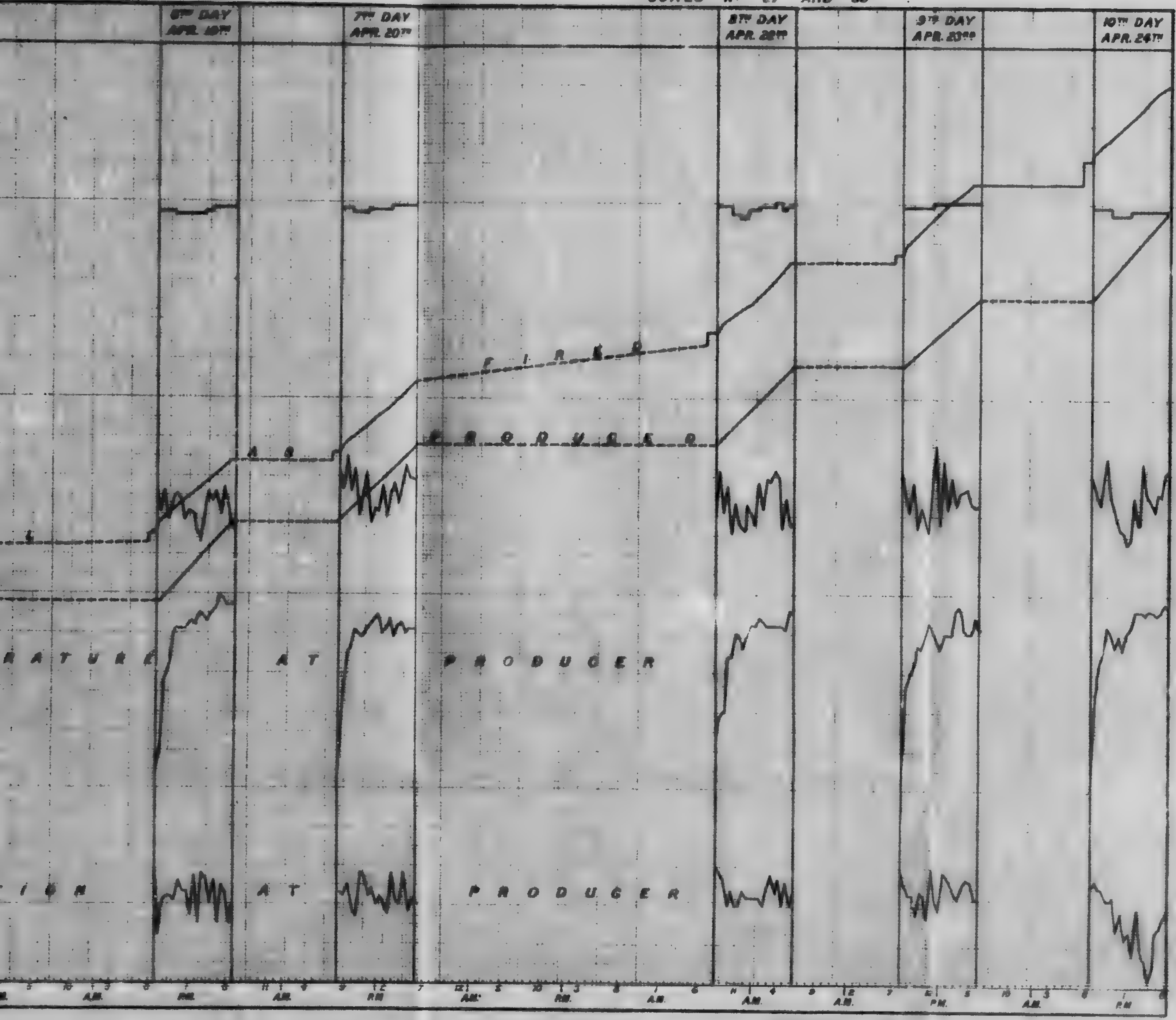
1

PRODUCER TRIA



TRIAL NO. 42

COALS Nº 27 AND 30



APPENDIX III VOL V

CASCADE COAL FIELD

ALBERTA.

TRIAL OF No. 4 PRODUCER WITH COAL No. 25

Date—March 25 and 26, 1909.

Trial Number—3.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial.	29 10 inches
" " 9.00 p.m., March 25	28 76 "
" " end of trial	28 88 "
Total water used.	34,511 lbs.
Brick in producer base	950 "
Average level of coal below the top plate of the producer	16 3 inches

TIME.		
2 50 a.m.,	March 25	Fire started with 10 lbs. of shavings, 35 lbs. of wood, and 152 lbs. of coke.
4 00 "	" "	On down-draft with fan exhausting directly to the atmosphere.
4.10 "	" "	Charged 102 lbs. of coke.
6.00 "	" "	" 100 " coal.
7 00 "	" "	" 75 " "
7 30 "	" "	" 75 " "
8 25 "	" "	On down-draft with exhauster.
8 30 "	" "	Charged 75 lbs. of coal.
8.35 "	" "	Started engine.
8 40 "	" "	Started trial.
4 00 p.m.,	" "	Gas washer blown through with steam.
8 40 a.m.,	" 26	Completed the trial.

Tar from wet scrubber Soot from pipes Tar from gas washer	17 lbs
Wet refuse removed from the producer during the trial	1,308 "
A sample of 274 lbs. of this when dried weighed	182 "
Wet refuse removed at the end of the trial	1,016 "
A sample of 221 lbs. of this when dried weighed	132 "

The valves were not cleaned after the trial

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 25 and 26 1909. Trial Number 37.

Note: R. and B. apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent	per cent	per cent.
9 05 a.m.	8·3	0·6	0·1	9·0	3·0	10·0	69	22·1
10 00 "	11·0	0·4	0·0	11·3	2·0	10·2	65·1	23·5
11 00 " .	10·8	0·3	0·0	9·8	2·6	13·1	63·4	25·5
12 00 p.m. . .	9·6	0·5	0·0	11·3	2·2	9·5	66·9	23·0
1 00 "	14·5	0·4	0·0	11·1	1·9	15·8	56·3	28·8
2 00 "	8·3	0·3	0·0	10·4	2·6	13·4	65·0	26·4
3 00 "	14·8	0·6	0·0	12·7	1·5	17·8	52·6	32·0
4 00 "	10·4	0·2	0·0	12·5	2·2	10·4	64·3	25·1
5 00 "	10·3	0·4	0·0	15·2	2·1	5·1	66·9	22·4
6 30 "	13·5	1·1	0·2	7·9	3·4	8·5	65·4	20·0
8 40 "	10·2	1·1	0·1	12·2	2·1	10·6	63·7	25·0
10 00 "	9·3	0·5	0·0	13·3	1·6	4·9	70·4	19·8
12 00 a.m.	9·1	0·5	0·0	11·5	2·5	15·1	61·3	29·1
1 30 " ..	13·2	0·4	0·0	12·4	2·2	14·7	57·1	29·3
3 00 "	15·0	0·5	0·0	10·8	2·1	13·5	58·1	26·4
4 00 "	15·7	0·5	0·1	10·2	2·5	11·6	59·4	24·4
5 00 "	14·8	0·5	0·1	10·5	2·4	12·6	59·1	25·6
6 00 "	14·5	0·5	0·0	10·6	2·5	14·2	57·9	27·1
7 00 "	14·4	0·5	0·3	10·3	2·4	12·6	59·5	25·6
8 00 "	14·3	0·4	0·1	10·7	2·0	12·5	60·0	25·3

OBSERVATIONS OF GAS METER AND B.H.P.

Date—March 25 and 26, 1909.

Trial Number -37.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8.40 a.m.	2850820		N.B.O.	250	100	150	51140
9 10 "	2852850	2030	"	250	100	150	
9 40 "	2854580	1730	"	250	100	150	
10 10 "	2856590	2010	"	250	100	150	
10 40 "	2858510	1920	"	250	100	150	61190
11 10 "	2860375	1865	"	250	100	150	
11 40 "	2862165	1790	"	250	100	150	
12 10 p.m.	2864240	2075	"	250	100	150	
12 40 "	2866140	1900	"	250	100	150	
1 10 "	2867880	1740	"	250	100	150	
1 40 "	2869600	1720	"	250	100	150	
2 10 "	2871460	1860	"	250	100	150	
2 40 "	2873560	2100	"	250	100	150	
3 10 "	2875680	2120	"	250	100	150	
3 40 "	2877290	1610	"	250	100	150	
4 10 "	2879335	2045	"	250	100	150	
4 40 "	2881430	2095	"	250	100	150	
5 10 "	2883520	2090	"	250	100	150	
5 40 "	2885550	2030	"	250	100	150	
6 10 "	2887400	1850	"	250	100	150	13560
6 40 "	2889225	1825	"	250	100	150	
7.10 "	2890790	1565	"	250	100	150	
7 40 "	2892845	2055	"	250	100	150	
8 10 "	2894785	1940	"	250	100	150	
8 40 "	2896720	1935	"	250	100	150	
9 10 "	2898705	1985	"	250	100	150	
9 40 "	2900490	1785	"	250	100	150	
10 10 "	2902495	2005	"	250	100	150	
10 40 "	2904405	1910	"	250	100	150	
11 10 "	2906335	1930	"	250	100	150	
11 40 "	2908185	1850	"	250	100	150	
12 10 a.m.	2910080	1895	"	250	100	150	
12 40 "	2911850	1770	"	250	100	150	
1 10 "	2913550	1700	"	250	160	150	
1 40 "	2915540	1990	"	250	100	150	62290
2 10 "	2917275	1735	"	250	100	150	
2 40 "	2919035	1760	"	250	100	150	
3 10 "	2921020	1985	"	250	100	150	
3 40 "	2922980	1960	"	250	100	150	
4 10 "	[illegible]	2020	"	250	100	150	
4 40 "	2926940	[illegible]	"	250	100	150	
5 10 "	2928940	2030	"	250	100	150	
5 40 "	2930945	2005	"	250	100	150	
6 10 "	2932982	1735	"	250	100	150	
6 40 "	2934950	1970	"	250	100	150	
7 10 "	2936820	1870	"	250	100	150	
7 40 "	2938880	2060	"	250	100	150	
8 10 "	2941010	2130	"	250	100	150	
8 40 "	2942815	1865	"	250	100	150	08291

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED

Date—March 25 and 26, 1909. Trial Number—37.

Note: Boys Calorimeter used.

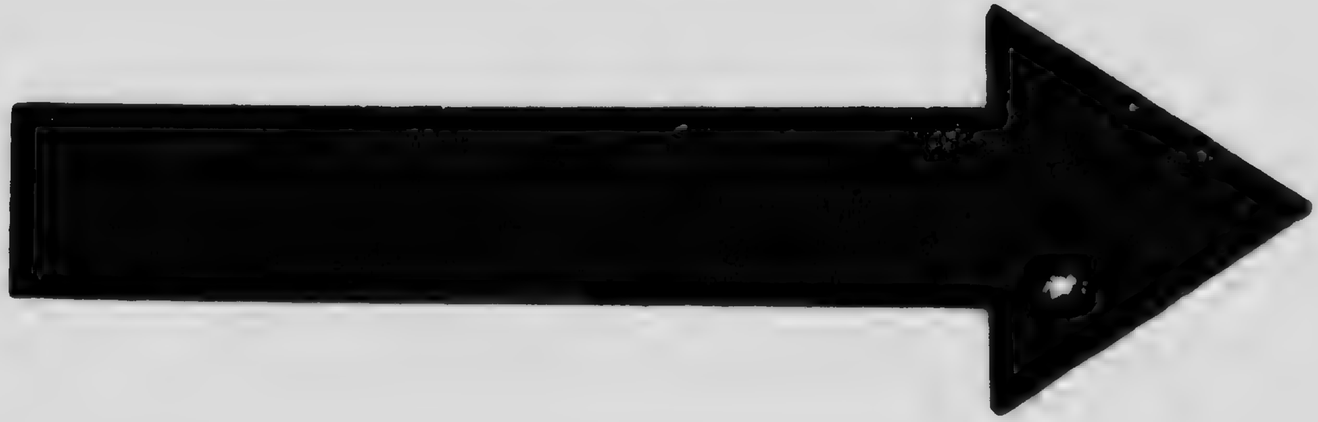
Time	Gas Temp. °F	Cubic Feet of Gas	Water Temp. Deg. Cent. Inlet	Water Temp. Deg. Cent. Outlet	Cubic Centimeters of Water	B.T.U. per Cubic Foot	Time	Coal Charged. lbs.	Total Coal. lbs.	Time of Poking.
8 40 a.m.	64	1	6·54	15·07	1770	89·5	8 40 a.m.	....	....	
9 10 "	64	½	5·58	14·14	1630	94·7	9 20 "	50	50	10 40
9 40 "	65	1	5·84	12·57	1600	85·3	10.20 "	50	100	10 45
10 10 "	65	1	5·68	11·51	1645	76·0	10 50 "	75	175	
10 40 "	63	1	4·98	11·69	1790	95·2	11 30 "	50	225	
11 10 "	63	1	4·79	11·34	1600	95·8	12 00 p.m.	50	275	
11 40 "	62	1	4·99	14·09	1600	92·2	12.35 "	50	325	12 30
12 10 p.m.	65	1	5·70	13·40	1735	78·3	1 10 "	25	350	
12 40 "	65	1	5·86	15·58	1715	99·0	1 55 "	50	400	2 15
1 10 "	67	1	5·96	15·41	1700	95·5	2 25 "	50	450	
1 40 "	68	1	6·07	13·97	1760	82·6	2.55 "	50	500	
2 10 "	68	½	6·08	13·45	1645	82·3	3 45 "	50	550	
2 40 "	68	½	3·55	11·56	1770	72·2	4 30 "	50	600	
3 10 "	67	½	5·52	19·81	1640	103·6	5 00 "	25	625	
3 40 "	68	1	6·65	13·15	1670	86·0	5 20 "	50	675	
4 10 "	67	½	5·29	12·19	1820	85·4	5 55 "	50	725	6 00
4 40 "	67	1	4·97	11·29	1680	84·1	7 00 "	50	775	
5 10 "	67	1	5·08	10·78	1800	81·3	7.45 "	50	825	
5.40 "	68	1	5·27	12·76	1750	77·9	9 00 "	50	875	9 00
6.10 "	Gas out in		Calorimeter.				9 50 "	50	925	
6 40 "	68	1	5·97	17·12	1715	111·3	10·25 "	50	975	10 25
7 10 "	68	½	6·02	14·00	1760	95·4	11 15 "	25	1000	
7 40 "	69	½	5·60	12·45	1745	91·7	12 30 a.m.	50	1050	
8 10 "	69	1	5·75	11·80	1820	88·8	1.10 "	50	1100	1 00
8 40 "	69	1	5·97	11·14	1905	85·5	1.55 "	50	1150	1 50
9 10 "	70	½	5·99	11·88	1715	96·0	2 30 "	50	1200	4 05
9 40 "	70	½	6·24	11·16	1755	82·0	4 10 "	25	1225	
10 10 "	70	½	6·20	11·51	1750	88·1	5 30 "	50	1275	
10 40 "	Calorimeter		not	working			6 25 "	25	1300	
11 10 "	69	½	5·99	11·60	1720	91·6	7 05 "	25	1325	
11 40 "	69	½	5·93	11·10	1700	83·5	8 15 "	25	1350	8 00
12 10 a.m.	69	1	5·97	13·79	1750	81·3				
12 40 "	69	½	5·92	14·79	1640	98·7				
1 10 "	68	½	5·35	12·81	1840	93·2				
1 40 "	68	1	5·31	13·75	1640	109·7				
2 10 "	68	1	5·00	12·65	1870	109·6				
2 40 "	67	1	4·98	11·68	1880	99·7				
3 10 "	68	½	5·35	13·77	1720	98·2				
3 40 "	68	½	5·57	13·94	1650	93·5				
4 10 "	69	½	5·60	14·28	1695	99·4				
4 40 "	70	½	5·54	1[illegible]·96	1750	100				
5 10 "	67	½	5·44	13·09	1790	93				
5 40 "	70	½	6·20	14·75	1710	99·1				
6 10 "	71	½	5·89	14·27	1720	98·0				
6 40 "	68	½	5·38	13·19	1795	95·1				
7.10 "	67	½	5·42	12·98	1825	93·7				
7.40 "	66	½	5·33	12·67	1785	89·0				
8 10 "	66	1	5·41	14·01	1700	87·0				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—March 25 and 26, 1909.

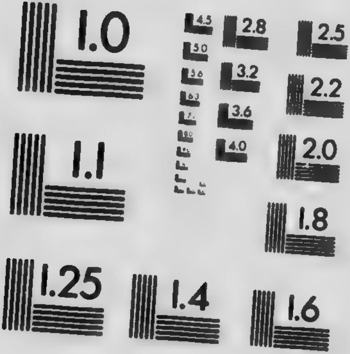
Trial Number 37.

Time.	Temperatures, °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet
8 40 a.m	660	67	67	95	3·9	7·9	8·1	8·3	3·3	1·0	62	58
9 10 "	680	68	68	129	4·0	8·3	8·5	9·3	3·0	0·8	58	54
9 40 "	710	68	69	130	3·9	7·4	7·6	8·9	3·4	1·1	72	66
10.10 "	720	69	70	137	4·0	7·7	7·9	8·8	3·4	1·0	74	68
10 40 "	700	69	65	141	3·5	5·7	5·9	6·5	2·7	0·3	68	64
11 10 "	710	68	62	142	3·6	6·1	6·3	7·7	2·9	0·8	66	60
11 40 "	720	67	63	140	3·9	7·5	7·7	9·2	3·5	1·2	70	65
12 10 "	720	68	69	138	4·1	8·1	8·3	9·4	4·0	1·1	56	50
12 40 p.m	720	68	68	139	3·7	6·7	6·9	8·0	3·6	1·0	36	30
1 10 "	720	70	72	140	3·5	5·7	5·9	6·8	3·3	0·9	38	31
1 40 "	700	72	72	136	3·9	7·4	7·6	8·5	3·4	1·0	62	58
2 10 "	700	71	72	148	3·9	7·8	8·0	9·3	3·6	1·1	70	65
2 40 "	720	70	70	148	4·0	7·4	7·6	9·0	3·5	1·1	68	63
3 10 "	760	70	70	150	3·6	6·0	6·2	7·2	3·4	1·1	44	35
3 40 "	700	70	68	143	3·4	6·0	6·2	6·9	3·0	1·0	72	68
4 10 "	720	70	70	148	3·9	7·4	7·6	10·7	3·7	1·1	60	53
4 40 "	740	72	68	145	4·0	7·5	7·7	9·0	3·7	1·0	70	62
5 10 "	720	72	68	142	4·0	7·5	7·7	9·3	3·7	1·4	55	50
5 40 "	720	70	68	142	4·0	7·5	7·7	9·9	3·9	1·2	58	53
6 10 "	810	70	70	145	3·7	6·0	6·2	8·8	4·0	1·0	57	52
6 40 "	700	70	70	146	3·3	4·9	5·1	5·6	2·8	0·4	28	20
7 10 "	700	70	70	150	3·9	4·3	7·5	9·4	3·5	1·0	45	40
7 40 "	740	70	70	148	4·0	7·3	7·5	9·0	3·4	1·0	66	62
8 10 "	700	70	72	150	4·0	6·8	7·0	7·6	3·3	1·0	65	61
8 40 "	720	70	72	148	4·0	7·0	7·2	8·2	3·3	1·1	78	73
9 10 "	700	70	73	145	3·8	6·4	6·6	7·0	3·3	1·1	72	67
9 40 "	700	72	72	140	3·7	6·7	6·9	7·8	3·5	1·1	73	68
10 10 "	720	71	73	136	4·0	7·4	7·6	8·9	3·7	1·1	75	70
10 40 "	700	72	74	140	4·0	7·0	7·2	8·2	3·7	1·1	74	69
11 10 "	700	72	72	142	4·0	6·0	6·2	6·8	[illegible]	1·0	70	65
11 40 "	720	72	72	134	3·9	6·8	7·0	7·2	3·4	1·0	70	65
12 10 a.m	740	70	72	142	3·6	5·2	5·4	6·6	3·3	1·1	70	65
12 40 "	700	69	69	140	3·9	6·2	6·1	7·7	3·6	1·3	73	69
1 10 "	710	69	68	131	3·7	5·3	5·5	7·8	4·0	1·6	50	45
1 40 "	750	68	68	136	3·4	5·4	5·6	5·7	3·5	1·2	68	64
2 10 "	760	67	68	138	3·8	6·6	6·8	7·3	3·6	1·1	66	61
2 40 "	790	67	68	135	3·9	7·0	7·2	8·3	4·2	1·6	54	50
3 10 "	810	67	70	136	3·9	7·2	7·1	8·5	4·3	1·6	59	47
3 40 "	820	67	72	142	3·9	7·2	7·1	8·7	4·3	1·7	60	47
4 10 "	820	68	73	140	3·9	7·2	7·4	8·3	4·0	1·4	48	38
4 40 "	820	68	74	140	3·9	7·0	7·2	7·9	3·6	1·1	75	43
5 10 "	830	69	66	141	3·9	7·1	7·3	8·0	3·7	1·1	56	46
5 40 "	840	69	73	143	4·0	7·8	8·0	8·8	4·0	1·3	55	46
6 10 "	820	72	76	144	4·0	7·7	7·9	8·1	3·7	1·2	46	38
6 40 "	830	70	68	143	3·8	6·9	7·1	7·4	3·8	1·5	47	40
7 10 "	830	70	68	142	3·8	6·9	7·1	8·2	4·2	1·3	57	47
7 40 "	840	70	68	145	4·5	7·6	7·8	9·0	4·4	1·6	46	37
8 10 "	860	70	69	144	4·0	7·7	7·9	8·7	4·4	1·6	48	40
8 40 "	840	70	69	145	3·5	6·2	6·8	6·8	3·6	1·3	60	51



MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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PRODUCER TRIAL No. 37.

Date—March 25-26, 1909. Producer No. 4, at McGill University.
Time of lighting up—2.50 a.m. Trial commenced 8.40 a.m. March 25; ended 8.40 a.m. March 26.
Duration of trial—24 hours. Kind of fuel—No. 25 coal.
Observers and staff during trial—Cameron, Killam, Gardner.
Computers—Cameron, Killam.
Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial	lbs.	1350
2.	Moisture in coal as charged	per cent.	0·9
3.	Calorific value of coal as charged, per lb	B.T.U.	13100
4.	“ “ of dry coal per lb	B.T.U.	13210
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 70·5; volatile matter, 15·6; ash, 13·0; moisture, 0·9	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 58·7; volatile matter, 3·1	Total per cent.	61·8
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	43·7

Gas.

8.	Total gas produced during trial (from meter readings)	cub. ft.	91995
9.	Average temperature of gas leaving producer	°F.	706
10.	“ “ “ at meter	°F.	69·5
11.	Average temperature of air in producer house	°F.	70·0
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	91·6
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	97·9
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	89·4
14.	Average barometric pressure	lbs. sq. in.	14·16
15.	“ suction at producer	ins. of water	1·12
16.	“ suction at exhauster	ins. of water	8·1
17.	“ pressure of gas at meter	ins. of water	5·36

Steam, Water, Etc.

18.	Total steam used in producer during trial	lbs.	2590
19.	“ water used in scrubber and gas washer	lbs.	34511
20.	“ tar extracted in scrubber and gas washer	lbs.	17
21.	Average power required to drive exhauster	H.P.	2·5
22.	“ “ “ gas washer	H.P.	1·5

Engine.

23.	Total revolutions during trial (from counter)		313702
24.	Average explosions per minute		104·9
25.	Average effective load on brake	lbs.	150
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	56·5

28. **Notes.**

Fire poked at: 9.00, 10.15 a.m.; 12.15, 1.55, 5.50, 9.00 p.m.; 12.30, 1.50 a.m.
Refuse removed at: 10.10, 10.45 a.m.; 12.30, 2.15, 6.00, 9.00, 10.25 p.m.; 1.00, 1.50, 4.05, 8.00 a.m.
Behaviour of coal: Very good.
Average time between poking: 3 hours.
Clinker: No arch or clinker formed.
Tar: Very little dirt or tar given off.
State of engine valves at end of trial: Did not need cleaning.
Valves last cleaned: March 9, 1909.

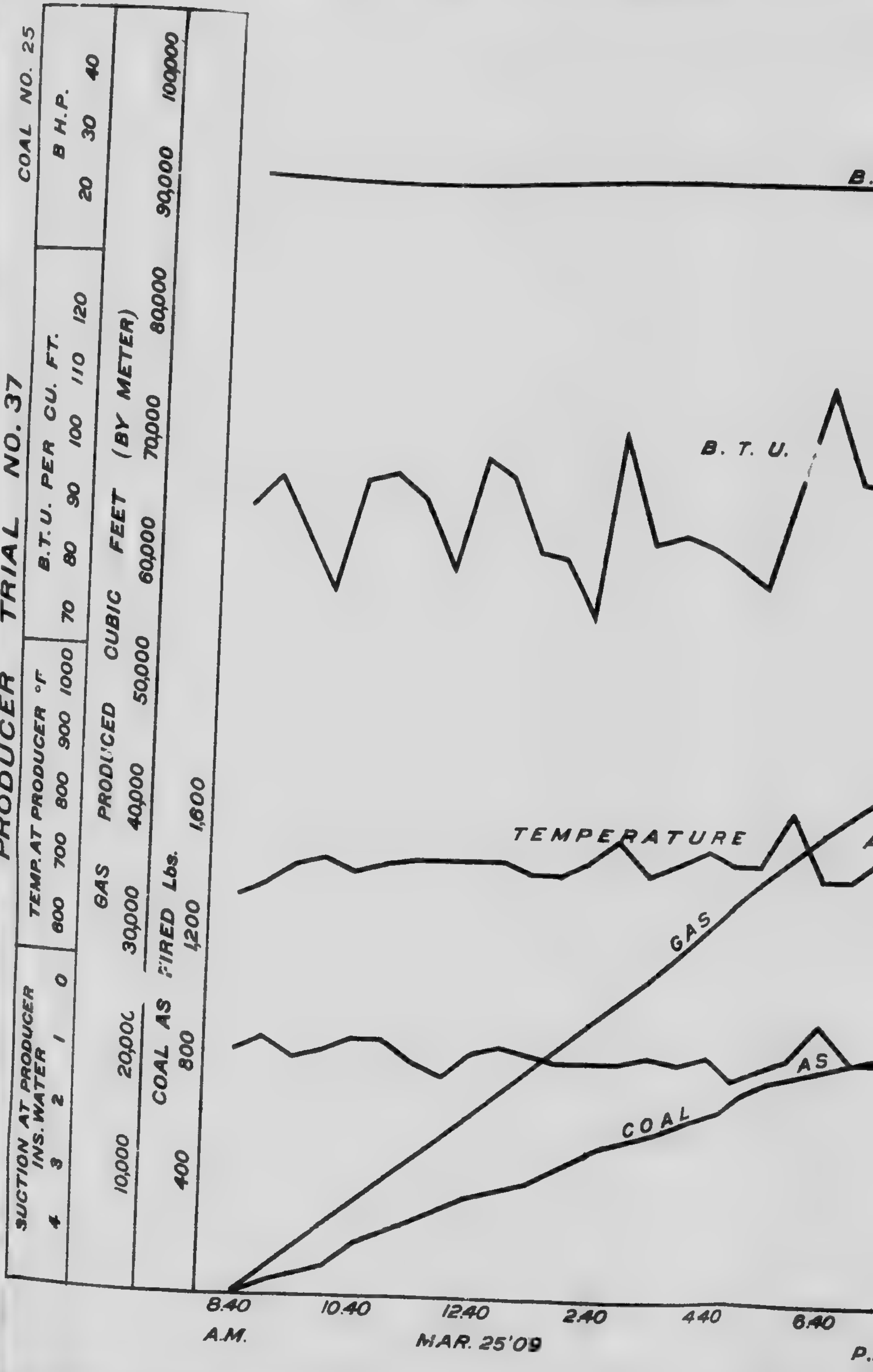
29. Analysis of Dry Coal.

Hydrogen	3·8%
Carbon	74·6%
Nitrogen	1·6%
Oxygen	6·9%
Sulphur	0·8%
Total carbon contained by dry coal charged	999·0 lbs.

30. Analysis of Gas by Volume.

Carbon dioxide	12·1%
Oxygen	0·5%
Carbon monoxide	11·2%
Hydrogen	11·8%
Methane	2·3%
Ethylene	0·1%
Nitrogen	62·0%

PRODUCER TRIAL NO. 37 COAL NO. 25


PRODUCER TRIAL NO. 37
COAL NO. 25
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
TEMP. AT PRODUCER °F
600 700 800 900 1000
B.T.U. PER CU. FT.
70 80 90 100 110 120
B.H.P.
20 30 40
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600
B.
B. T. U.
TEMPERATURE
GAS
AS
COAL
8.40 A.M.
10.40
12.40
2.40
4.40
6.40
MAR. 25'09
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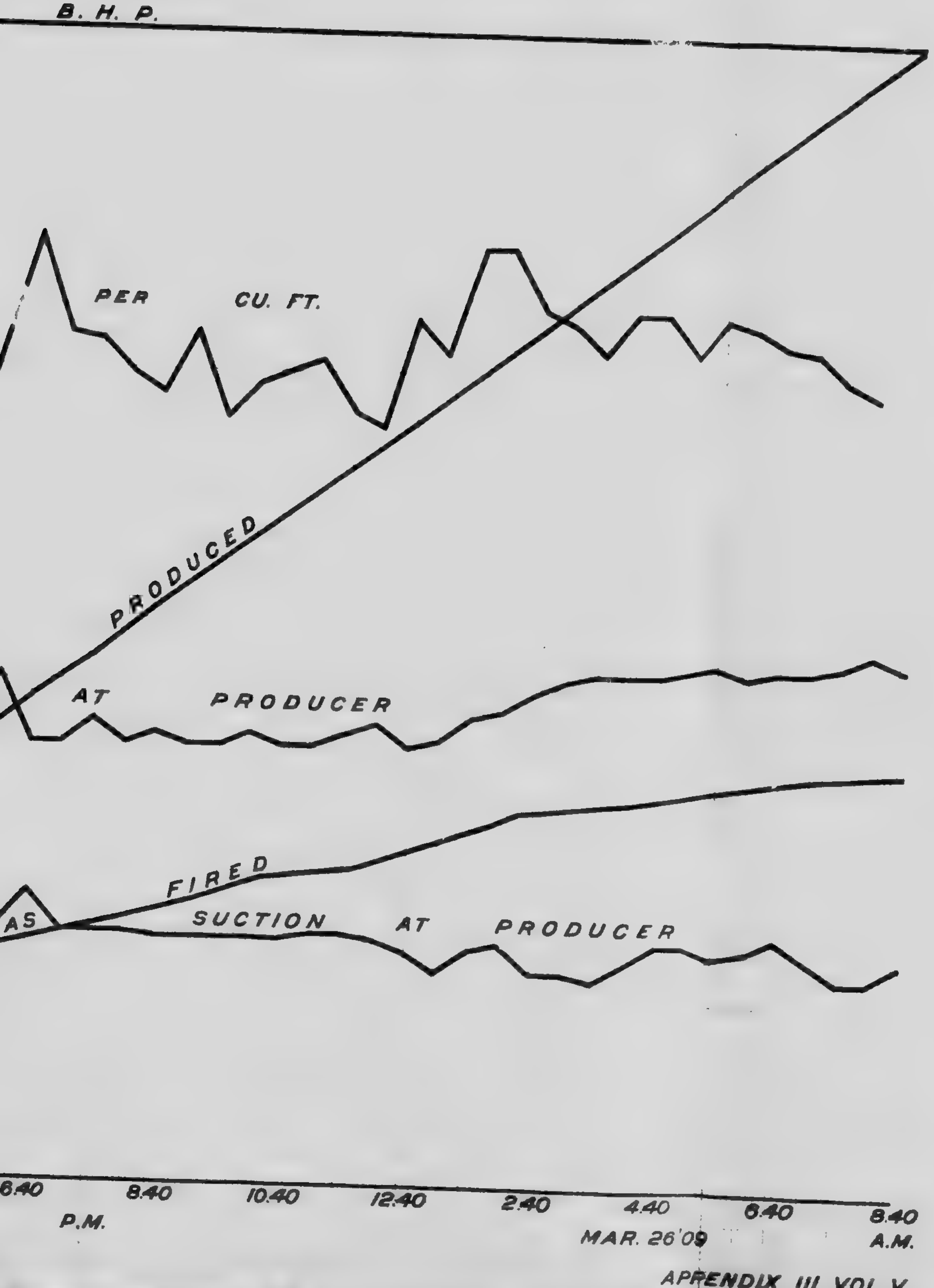

APPENDIX III VOL.V

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Remarks.

The gas was poor, bad patches coming through and slowing down the engine from time to time. During last six hours double the amount of steam was used. This caused a marked improvement in quality and steadiness of gas and reduced coal consumption. It appears that if this large quantity of steam had been used from start better results would have been obtained.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	1339
33.	Average B.H.P. of engine during trial	lbs.	1162
34.	“ indicated H.P. of engine during trial	H.P.	23·85
35.	“ H.P. taken by exhauster and gas washer	H.P.	33·93
36.	“ B.H.P. while gas consumption of engine was taken	H.P.	4·0
37.	“ “ corresponding to total gas produced	H.P.	23·85
38.	“ “ “ “ “ “ and available	H.P.	23·85
	for outside use, allowing for power used	H.P.	19·85

Hourly Quantities.

39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	56·25
41.	Combustible charged per hour	lbs.	55·70
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	48·4
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	14·1
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	13·9
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	12·1
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	9·44
47.	Gas (by meter) supplied by producer per hour	lbs.	15·72
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft	3830
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3588
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3830
51.	Calorific value of coal charged per hour	cub. ft.	3588
52.	“ “ gas produced per hour (lower value)	B.T.U.	737000
53.	Steam used in producer per hour	B.T.U.	320500
		lbs.	108

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	63·8
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	64·5
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	74·2
58.	“ “ “ “ “ “ B.H.P. “	cub. ft.	105·7
59.	Steam used in producer per lb. coal charged	cub. ft.	150·2
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	1·92
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	25·6
62.	Efficiency of process of gas production and cleaning, based on coal charged	lbs.	375·0
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	43·4
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	36·3
65.	Thermal efficiency of engine, based on B.H.P	per cent.	29·1
66.	Over all efficiency of producer and engine plant	per cent.	18·9
67.	Calorific value of gas supplied to engine per B.H.P. per hour	per cent.	8·23
68.	“ “	B.T.U.	13,420
	coal charged into producer per B.H.P. per hr.	B.T.U.	30,920

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	2·36	2·34	2·03
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·83	2·80	2·43
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	3·52	3·49	3·03

TRIAL OF No. 4 PRODUCER WITH COAL No. 25 (Second Trial)

Date—March 29 and 30, 1909. Trial Number—38.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·15 inches.
" " 10 p.m., March 29	29·20 "
" " end of trial	29·26 "
Total water used	35,100 lbs.
Brick in producer base	900 "
Average level of coal below the top plate of the producer	27·25 inches.

TIME				
3.30	a.m.,	March	29	Fire started with 10 lbs. of shavings, 40 lbs. of wood, 135 lbs. of coke.
4.30	"	"	"	Producer on down-draft with fan exhausting directly to the atmosphere.
5.00	"	"	"	Charged 100 lbs. of coal.
7.15	"	"	"	" 120 " "
8.20	"	"	"	On down-draft with exhauster.
8.25	"	"	"	Charged 75 lbs. of coal.
8.30	"	"	"	Started engine.
8.40	"	"	"	Trial commenced.
11.20	"	"	"	Gas washer blown through with steam.
12.40	p.m.	"	30	" " "
7.40	"	"	"	Trial completed.

Explosion counter out of order during pa

20 lbs. of tar removed from the wet scru

Weight of wet refuse removed during the	129 lbs.
This quantity when dried weighed	84
Weight of wet refuse removed at the en	727 "
A sample of 147 lbs. of this when dried	81 "

Valve spindles were cleaned after the was no tar but valve spindles were dry and sticky

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—March 29 and 30, 1909.

Trial Number—38.

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.00 a.m.	9·2	0·8	0·1	9·6	3·3	9·5	67·8	22·2
10 00 "	11·2	0·8	0·2	10·6	2·2	12·2	62·8	25·2
11 00 "	13·6	0·6	0·0	10·3	2·6	11·1	61·8	24·0
12 00 p.m.	14·0	0·7	0·0	10·1	1·7	11·7	61·8	23·5
1 10 "	14·8	0·4	0·0	11·5	1·9	15·0	56·4	28·4
2.00 "	12·4	0·5	0·0	12·3	1·6	10·4	62·8	24·3
3 00 "	14·5	0·6	0·0	10·4	2·0	12·1	60·4	24·5
4.00 "	14·8	0·5	0·0	10·7	1·6	11·7	60·7	24·0
5.00 "	14·1	0·7	0·0	11·3	2·1	9·8	62·0	23·2
7 00 "	14·7	0·7	0·0	9·5	2·4	12·0	60·7	23·9
8 30 "	13·3	0·6	0·1	10·2	2·0	13·9	59·9	26·2
10 00 "	14·7	0·6	0·0	10·5	1·6	14·2	58·4	26·3
11 30 "	13·0	0·6	0·2	10·4	2·1	11·6	62·1	24·3
1 00 a.m.	12·5	0·6	0·0	10·8	2·0	12·4	61·7	25·2
2 30 "	13·1	0·6	0·0	10·0	0·20	11·7	60·6	23·7
3 50 "	12·2	0·7	0·0	11·0	0·20	14·4	59·7	27·4
5 00 "	10·0	0·6	0·1	7·9	0·30	9·6	68·8	20·6
6 00 "	13·4	0·7	0·0	10·8	0·21	11·8	61·2	24·7
7 15 "	14·0	0·4	0·1	11·2	0·19	11·8	60·6	25·0

OBSERVATIONS OF GAS METER AND B.H.P.

Date—March 29 and 30, 1909. Trial Number—38.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.		Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
		cub. ft.			lbs.	lbs.	lbs.	
8.40	a.m.	2943470	....	N.B.O.	250	100	150	09150
9.10	"	2945220	1750	"	250	100	150	
9.40	"	2947150	1930	"	250	100	150	
10.10	"	2949040	1890	"	250	100	150	
10.40	"	2950920	1880	"	250	100	150	
11.10	"	2952860	1940	"	250	100	150	
11.40	"	2954950	2000	"	250	100	150	
12.10	p.m.	2956850	1900	"	250	100	150	
12.40	"	2958950	2100	"	250	100	150	35795
1.10	"	2961110	2160	"	250	100	150	
1.40	"	2962970	1860	"	250	100	150	
2.10	"	2965150	2180	"	250	100	150	
2.40	"	2967050	1900	"	250	100	150	
3.10	"	2968970	1920	"	250	100	150	
3.40	"	2971130	2160	"	250	100	150	
4.10	"	2973130	2000	"	250	100	150	
4.40	"	2975170	2040	"	250	100	150	
5.10	"	2977180	2010	"	250	100	150	
5.40	"	2979120	1940	"	250	100	150	
6.10	"	2980930	1810	"	250	100	150	
6.40	"	2982950	2020	"	250	100	150	
7.10	"	2984400	1450	"	250	100	150	
7.40	"	2986360	1960	"	250	100	150	
8.10	"	2988180	1820	"	250	100	150	
8.40	"	2990120	1940	"	250	100	150	
9.10	"	2992050	1930	"	250	100	150	
9.40	"	2993450	1900	"	250	100	150	
10.10	"	2995860	1910	"	250	100	150	
10.40	"	2997850	1970	"	250	100	150	
11.10	"	2999850	2020	"	250	100	150	
11.40	"	3001750	1900	"	250	100	150	
12.10	a.m.	3003630	1880	"	250	100	150	
12.40	"	3005440	1810	"	250	100	150	
1.10	"	3000748	2040	"	250	100	150	
1.40	"	3009600	2120	"	250	100	150	
2.10	"	3011540	1940	"	250	100	150	
2.40	"	3013620	2080	"	250	100	150	
3.10	"	3015700	2080	"	250	100	150	
3.40	"	3017920	2220	"	250	100	150	
4.10	"	3020020	2100	"	250	100	150	
4.40	"	3021970	1950	"	250	100	150	
5.10	"	3023990	2020	"	250	100	150	
5.40	"	3026080	2090	"	250	100	150	
6.10	"	3028080	2000	"	250	100	150	
6.40	"	3030050	1970	"	250	100	150	
7.10	"	3032280	2230	"	250	100	150	
7.40	"	3034410	2130	"	250	100	150	61921

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—March 29 and 30, 1909.

Trial Number—38.

Note: Boys Calorimeter used

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
8 40 a.m.	55	$\frac{2}{3}$	3·59	14·15	1705	107·5	8.40 a.m.	lbs.	lbs.	
9.10 “	57	$\frac{7}{12}$	3·76	11·31	1600	84·3	9.05 “	75	75	9 30 a.m.
9.40 “	57	$\frac{7}{12}$	3·84	13·30	1625	104·5	10 25 “	50	125	
10.10 “	58	$\frac{7}{12}$	3·52	11·37	1815	96·8	11.30 “	50	175	
10 40 “	58	$\frac{1}{2}$	4·07	11·20	1605	91·3	12.55 p.m.	50	225	12.10 p.m.
11 10 “	59	$\frac{1}{2}$	3·69	11·16	1600	94·8	2.30 “	50	275	
11.40 “	60	$\frac{7}{12}$	3·89	11·96	1845	10·10	4.30 “	50	325	
12.10 p.m.	61	$\frac{1}{2}$	3·85	11·11	1640	94·2	5.05 “	50	375	
12 40 “	62	$\frac{1}{2}$	3·95	10·72	1715	92·0	6.05 “	50	425	
1.10 “	62	$\frac{1}{2}$	4·06	11·79	1715	105·0	7.15 “	50	475	
1 40 “	63	$\frac{1}{2}$	4·17	11·27	1720	96·2	8 30 “	50	525	8.30 “
2 10 “	64	$\frac{1}{2}$	4·28	11·05	1810	97·2	10 00 “	50	575	
2 40 “	64	$\frac{7}{12}$	4·64	13·49	1635	98·3	11.30 “	50	625	
3.10 “	65	$\frac{7}{12}$	4.78	12·65	1650	88·2	12.30 a.m.	50	675	
3 40 “	65	$\frac{7}{12}$	4·74	13·36	1635	95·7	1.30 “	50	725	1.00 “
4.10 “	65	$\frac{1}{2}$	4·80	12·72	1820	85·7	2.30 “	50	775	
4 40 “	65	$\frac{7}{12}$	4·90	13·07	1640	90·9	3.40 “	50	825	
5.10 “	66	$\frac{7}{12}$	4·82	13·32	1710	98·6	4.40 “	50	875	4.10 “
5.40 “	66	$\frac{7}{12}$	4·92	13·59	1600	94·1	5.40 “	50	925	4.45 “
6.10 “	66	$\frac{7}{12}$	5·02	13·06	1670	91·3	6.45 “	36	961	6.45 “
6.40 “	67	$\frac{7}{12}$	5·54	14·59	1780	109·5				
7 10 “	68	$\frac{7}{12}$	5·82	12·04	1820	76·7				
7 40 “	68	$\frac{7}{12}$	6·05	13·46	18[illegible]	90·6				
8.10 “	68	$\frac{7}{12}$	5·87	13·08	1785	87·5				
8.40 “	69	$\frac{7}{12}$	6·07	13·53	1750	88·6				
9.10 “	69	$\frac{7}{12}$	5·81	13·81	1660	90·0				
9.40 “	69	$\frac{7}{12}$	5·72	13·52	1625	86·2				
10.10 “	69	$\frac{7}{12}$	5·81	14·45	1640	94·4				
10 40 “	69	$\frac{7}{12}$	5·87	13·50	1635	84·8				
11.10 “	70	$\frac{7}{12}$	5·67	12·74	1650	79·2				
11 40 “	70	$\frac{7}{12}$	5·85	15·49	1630	106·7				
12 10 a.m.	70	$\frac{7}{12}$	5·77	13·70	1660	89·2				
12.40 “	68	$\frac{7}{12}$	6·39	13·88	1780	90·4				
1 10 “	70	$\frac{7}{12}$	5·97	12·99	1830	87·3				
1.40 “	70	$\frac{7}{12}$	5·78	12·67	1920	89·7				
2 10 “	70	$\frac{1}{2}$	5·77	11·90	1675	81·5				
2 40 “	70	$\frac{1}{2}$	5·66	12·24	1690	88·0				
3 10 “	70	$\frac{3}{4}$	5·70	14·90	1710	83·0				
3 [illegible] “	70	$\frac{3}{4}$	5·61	15·15	1720	78·0				
4 10 “	70	$\frac{7}{12}$	5·60	12·57	1690	80·0				
4 40 “	70	$\frac{7}{12}$	5·62	12·01	1695	73·6				
5 10 “	70	$\frac{7}{12}$	5·51	12·33	1860	86·2				
5 40 “	70	$\frac{7}{12}$	5·55	12·47	1850	87·0				
6.10 “	70	$\frac{7}{12}$	5·62	12·56	1835	86·5				
6 40 “	70	$\frac{7}{12}$	5·70	12·36	1860	84·2				
7 10 “	70	$\frac{7}{12}$	5·96	12·56	1900	85·1				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—March 29 and 30, 1909. Trial Number—38.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8 40 a.m.	510	57	53	60	3·5	5·4	3·7	6·1	2·7	0·6	40	36
9.10 "	770	58	58	120	3·8	7·0	7·2	9·3	3·6	1·0	39	23
9.40 "	780	59	60	163	3·8	7·0	7·2	8·8	3·2	0·7	63	[illegible]
10.10 "	700	60	60	99	3·8	7·0	7·2	9·0	3·3	0·8	55	50
10 40 "	760	60	60	158	3·9	7·4	7·6	9·4	3·4	0·9	57	52
11.10 "	800	60	63	110	3·8	7·2	7·4	9·1	3·4	0·9	40	33
11.40 "	850	62	64	140	4·3	8·3	8·5	10·4	3·8	1·1	45	34
12.10 p.m.	810	65	65	138	4·1	7·7	7·9	8·8	3·5	0·8	49	40
12 40 "	830	66	65	141	4·2	7·8	8·0	9·0	[illegible]	0·8	62	53
1 10 "	810	65	66	147	3·7	6·3	6·5	6·8	[illegible]	0·7	62	53
1 40 "	870	65	67	148	4·2	8·0	8·2	9·0	3·5	0·8	40	34
2.10 "	800	64	67	152	3·7	6·3	6·5	6·3	2·8	0·5	32	25
2 40 "	810	64	68	151	3·9	7·0	7·2	7·8	3·4	1·0	54	46
3 10 "	820	64	68	150	3·9	7·1	7·3	8·0	3·4	0·9	68	60
3.40 "	850	64	67	151	4·1	7·6	7·8	8·7	4·0	1·0	73	65
4.10 "	840	64	68	142	4·1	7·7	7·9	8·5	3·6	1·0	65	57
4 40 "	860	64	69	142	4·0	7·4	7·6	8·8	4·2	1·3	65	52
5.10 "	830	64	70	141	4·0	7·3	7·5	9·0	4·0	1·4	63	56
5.40 "	810	64	69	138	3·7	6·3	6·5	7·5	3·6	1·1	73	66
6.10 "	800	66	70	140	3·8	6·4	6·6	8·0	3·7	1·4	62	54
6.40 "	800	66	69	132	3·7	6·4	6·6	7·6	3·5	1·0	36	28
7.10 "	780	66	72	133	3·8	7·1	7·3	9·3	3·8	1·1	62	56
7 40 "	800	68	73	135	3·8	6·8	7·0	8·1	3·8	1·2	64	57
8 10 "	830	69	72	133	3·9	7·3	7·5	9·0	4·4	1·7	64	55
8.40 "	810	70	72	135	3·9	7·2	7·4	8·4	3·8	1·2	53	44
9.10 "	810	70	73	137	3·9	7·1	7·3	8·4	3·9	1·3	50	40
9 40 "	790	70	73	130	3·9	6·8	7·0	8·0	3·8	1·2	45	37
10.10 "	800	70	73	130	3·7	6·3	6·5	7·6	4·1	1·3	54	45
10.40 "	840	70	72	130	4·1	7·6	7·8	9·1	4·3	1·8	60	51
11.10 "	860	70	73	133	4·0	7·5	7·7	9·3	4·3	1·9	63	53
11 40 "	810	70	72	132	3·4	5·5	5·7	7·1	4·2	1·8	67	60
12.10 a.m.	820	70	73	132	3·9	7·3	7·5	9·6	5·0	2·5	62	55
12 40 "	790	70	69	133	3·4	5·6	5·8	10·0	4·1	1·5	60	[illegible]
1.10 "	860	73	73	133	4·2	8·1	8·3	10·4	5·1	2·4	59	[illegible]
1.40 "	820	72	73	133	3·9	6·8	7·0	8·10	3·9	1·2	54	47
2.10 "	860	70	73	135	4·1	7·7	7·9	10·5	4·9	2·2	59	48
2.40 "	820	70	73	130	3·7	6·5	6·7	8·3	4·0	1·2	57	48
3.10 "	860	70	73	134	4·2	8·0	8·2	10·6	4·7	1·8	47	39
3.40 "	860	70	72	135	4·3	7·9	8·1	10·8	4·8	2·0	57	49
4.10 "	860	70	71	137	4·1	7·4	7·6	10·5	4·8	2·0	57	48
4.40 "	860	70	72	136	4·1	7·3	7·5	9·4	3·9	1·2	70	62
5 10 "	790	70	72	137	4·1	7·5	7·7	10·2	4·0	1·3	71	67
5.40 "	810	70	72	136	4·1	7·4	7·6	10·1	4·2	1·5	64	57
6.10 "	800	70	73	138	3·8	6·4	6·9	8·7	4·0	1·3	59	51
6.40 "	820	70	72	137	4·0	7·3	7·5	9·7	4·0	1·4	55	48
7.10 "	860	70	73	145	4·5	8·6	8·8	8·5	4·6	1·8	62	53
7.40 "	860	70	74	145	4·3	7·7	7·9	7·6	4·2	1·5	74	66

PRODUCER TRIAL No. 38

Date—March 29 and 30, 1909. Producer No. 4, at McGill University.
Time of lighting up—3.30 a.m. Trial commenced 8.40 a.m. March 29; ended 7.40 a.m. March 30.
Duration of trial—23 hours. Kind of fuel—No. 25 coal.
Observers and staff during trial—Killam, Cameron, Gardner.
Computers—Killam, Cameron.
Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

	FUEL.		
1.	Total coal charged during trial	lbs.	961
2.	Moisture in coal as charged	per cent.	0·7
3.	Calorific value of coal as charged, per lb	B.T.U.	13120
4.	" " of dry coal per lb	B.T.U.	13210
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 70·3; volatile matter, 16·7; ash, 12·3; moisture, 0·7	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 38·9; volatile matter, 5·8	Total per cent.	14·7
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	32·75
	GAS.		
8.	Total gas produced during trial (from meter readings)	cub. ft.	90040
9.	Average temperature of gas leaving producer	°F.	772
10.	" " " at meter	°F.	67
11.	Average temperature of air in producer house	°F.	69
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	90·7
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	95·4
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	87·2
14.	Average barometric pressure	lbs. sq in.	14·31
15	" suction at producer	ins. of water	1·3
16	" suction at exhauster	ins. of water	8·8
17.	" pressure of gas at meter	ins. of water	5·52
	STEAM, WATER, ETC.		
18.	Total steam used in producer during trial	lbs.	2760
19.	" water used in scrubber and gas washer	lbs.	35100
20.	" tar extracted in scrubber and gas washer	lbs.	20
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " gas washer	H.P.	1·5
	ENGINE.		
	Total revolutions during trial (from counter)		305542
24.	Average explosions per minute		101·5
25.	Average effective load on brake	lbs.	150
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	55·9
28.			

Notes.

Fire poked at: 9.30 a.m.; 12.10, 8.30 p.m.; 1.00, 4.10, 4.55, 6.45 a.m.
Refuse removed at: 8.30, 10.30 p.m.; 1.00, 4.10, 6.35 a.m.
Behaviour of coal: Worked well in producer.
Average time between poking: 3 hours, 17 minutes
Clinker: Few small bits in refuse.
Tar: Little.
State of engine valves at end of trial: Dry and rather sticky.
Valves last cleaned: March 9, 1909

29. ANALYSIS OF DRY COAL.

Hydrogen	3·8%
Carbon	74·6%
Nitrogen	1·6%
Oxygen	6·9%
Sulphur	0·8%
Total carbon contained by dry coal charged	712·0 lbs.

30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	13·2%
Oxygen	0·6%
Carbon monoxide	10·5%
Hydrogen	11·9%
Methane	2·1%
Ethylene	0·1%
Nitrogen	61·6%
	100·0%

REMARKS.

Uniform gas of low calorific value, ran engine at constant load throughout trial. No trouble was found with dirt or tar, once or twice during night a slight choke seemed to form in pipe. A large amount of steam was used, coal consumption was low and refuse well burnt.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	955
32.	Combustible charged during trial	lbs.	836
33.	Average B.H.P. of engine during trial	H.P.	24·23
34.	" indicated H.P. of engine during trial	H.P.	32·50
35.	" H.P. taken by exhauster and gas washer	H.P.	4·0
36.	" B.H.P. while gas consumption of engine was taken	H.P.	24·23
37.	" " corresponding to total gas produced	H.P.	24·23
38.	" " " " " " and available for outside use, allowing for power used	H.P.	20·23

HOURLY QUANTITIES.

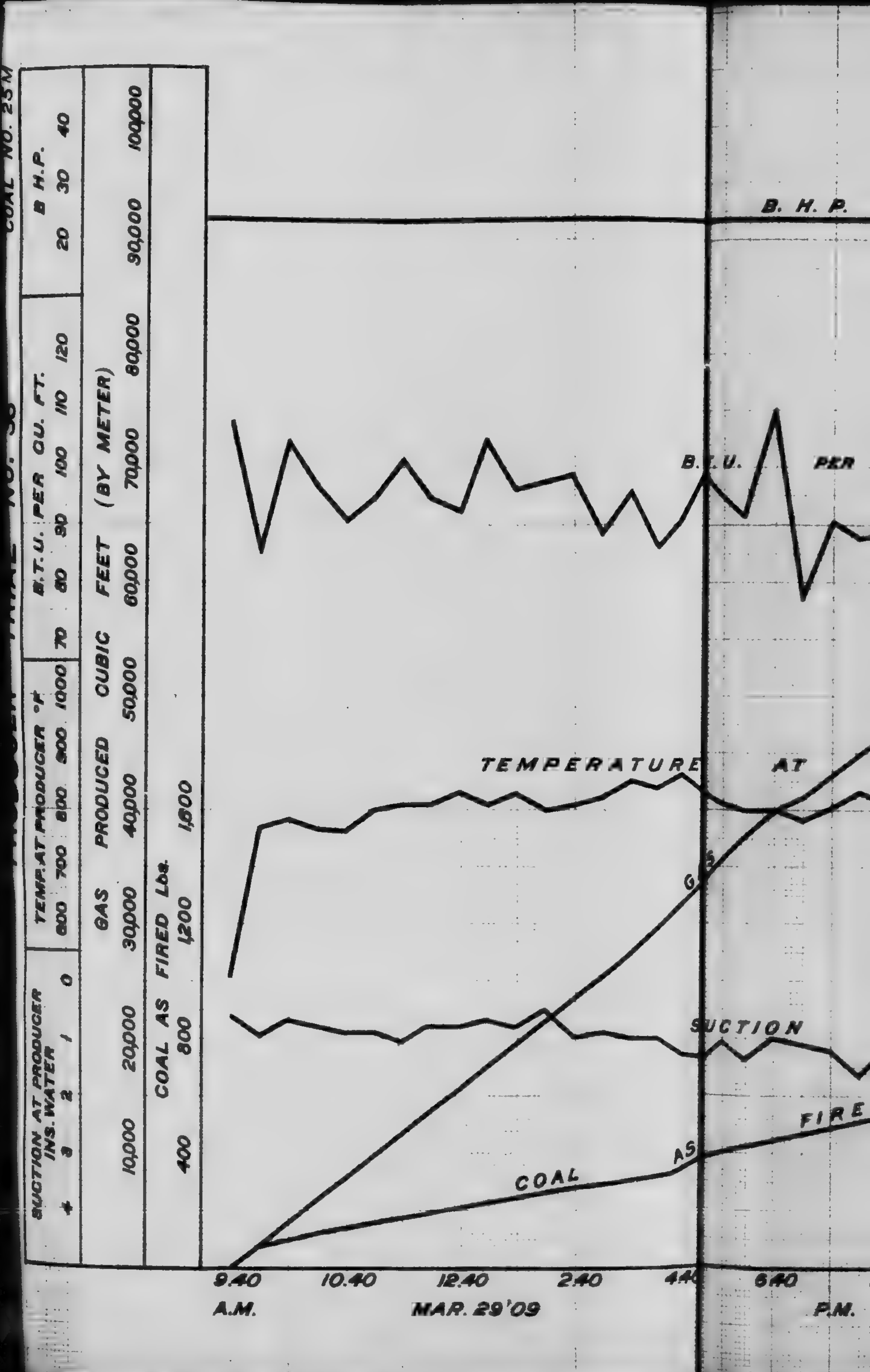
39.	Coal charged per hour	lbs.	41·80
40.	Dry coal charged per hour	lbs.	41·5
41.	Combustible charged per hour	lbs.	36·4
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	10·5
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	10·4
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	9·1
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	6·88
46	Coal (as charged) per hour equivalent to steam used in producer	lbs.	15·22
47.	Gas (by meter) supplied by producer per hour	cub. ft.	39·53
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	37·60
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	39·53
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	37·60
51.	Calorific value of coal charged per hour	B.T.U.	549000
52.	" " gas produced per hour (lower value)	B.T.U.	327100
53.	Steam used in producer per hour	lbs.	120

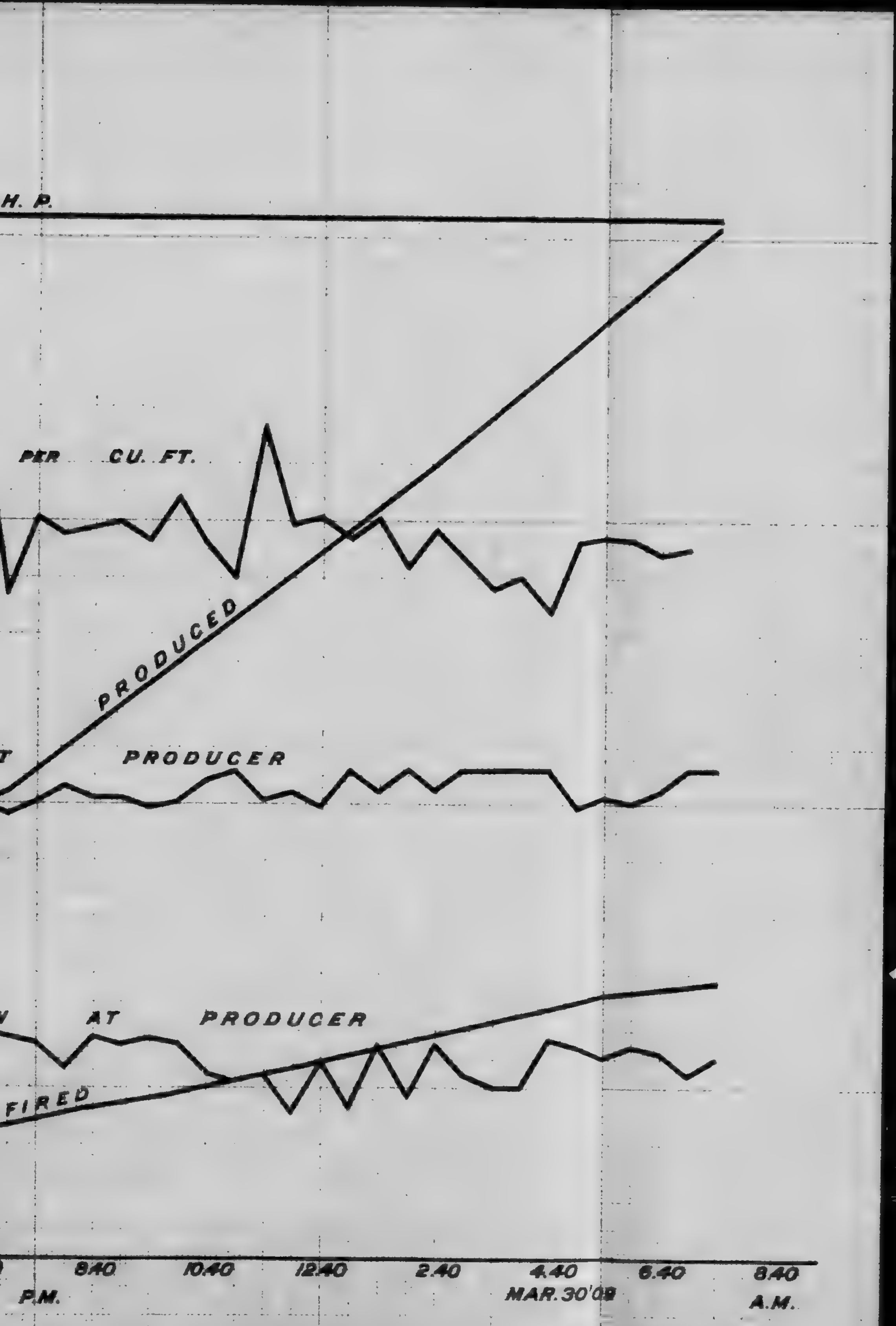
ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	89·9
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	90·6
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	103·3
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I H.P. per hr.	cub. ft.	115·5
58.	" " " " " " B.H.P. "	cub. ft.	155·0
59.	Steam used in producer per lb. coal charged	lbs.	2·87
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	36·5
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	386·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	60·0
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	49·8
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent	36·6
65.	Thermal efficiency of engine, based on B.H.P	per cent.	18·8
66.	Over all efficiency of producer and engine plant	per cent.	11·27
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13520
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	22566

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·72	1·71	1·50
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·07	2·05	1·80
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·82	2·80	2·45

PRODUCER TRIAL NO. 38 COAL NO. 25M

COAL NO. 25 M
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
TEMP. AT PRODUCER °F.
600 700 800 900 1000
B.T.U. PER CU. FT.
70 80 90 100 110 120
B H.P.
20 30 40
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1,200 1,600
B. H. P.
B.T.U. PER
TEMPERATURE AT
GAS
SUCTION
COAL AS FIRE
9.40 10.40 12.40 2.40 4.40 6.40
A.M.
MAR. 29 '09
P.M.



APPENDIX III VOL.V

TRIAL OF No. 4 PRODUCER WITH COAL No. 23 M.

Date—April 8 and 9, 1909.

Trial Number—41.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·39 inches.
" " 8 p.m., April 8	29·66 "
" " end of trial	29·59 "
Total water used during trial	28,750 lbs.
Brick in producer base	960 "
Average level of coal below the top plate of the producer	18·7 inches.

TIME.	
2.05 a.m., April 8	Fire started with 10 lbs. of shavings, 40 lbs. of wood, 100 lbs. of coke.
3.30 " " "	On down-draft with fan exhausting directly to the atmosphere.
3.40 " " "	Charged 100 lbs. of coal.
4.30 " " "	" 150 " "
6.00 " " "	" 100 " "
6.30 " " "	" 125 " "
7.00 " " "	" 50 " "
7.30 " " "	" 25 " "
8.30 " " "	On down-draft with exhauster.
8.35 " " "	Charged 50 lbs. of coal.
8.40 " " "	Started engine.
8.45 " " "	Commenced trial.
8.45 a.m., " 9	Trial finished.

Notes.

Neither the gas washer nor the sawdust scrubber was used.

Tar removed from wet scrubber amounted to	6 lbs.
Wet refuse removed during the trial	174 "
This quantity when dried	95 "
Wet refuse removed at the end of the trial	1,129 "
A sample of 288 lbs. of this when dried	167 "

The valves were not cleaned after the trial.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—April 8 and 9, 1909. **Trial Number—41.**

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.10 a.m.....	8·7	0·3	0·0	11·8	2·5	12·4	64·3	26·7
10.00 "	15·0	0·2	0·0	12·7	2·3	12·1	57·7	27·1
11.00 "	9·6	0·2	0·0	12·0	2·1	10·8	65·3	24·9
12.00 p.m.....	12·5	0·2	0·1	12·7	2·4	12·8	59·3	28·0
1 00 "	11·3	0·2	0·1	13·8	2·5	14·5	57·6	28·9
2.00 "	10·4	0·2	0·0	12·8	2·1	13·7	60·8	28·6
3.00 "	12·4	0·2	0·0	13·0	2·0	14·1	58·3	29·1
4.00 "	11·4	0·2	0·0	12·4	2·1	14·6	59·3	29·1
5.00 "	13·6	0·3	0·0	14	2·4	14·1	55·6	30·5
7.00 "	11·7	0·3	0·0	12·9	2·4	13·2	59·5	28·5
8.30 "	12·4	0·3	0·0	14·2	2·0	13·1	58	29·3
10.00 "	9·6	0·2	0·0	14·8	2·1	13·5	59·8	30·4
11.30 "	10·8	0·3	0·0	11·6	2·5	11·0	63·8	25·1
2.15 a.m.....	10·8	0·2	0·0	12·1	2·1	13·0	61·8	27·2
3.30 "	11·4	0·3	0·1	13·0	2·4	13·7	59·1	29·2
5.00 "	13·8	0·3	0·0	12·2	2·0	12·2	59·5	26·4
6.30 "	12·9	0·2	0·0	12·3	1·7	13·9	59·0	27·9
8.00 "	13·0	0·2	0·0	12·8	2·5	12·1	59·4	27·4

OBSERVATIONS OF GAS METER AND B.H.P.

Date—April 8 and 9, 1909.

Trial Number—41.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs.	
8 45 a.m.	3184700	....	N.B.O.	275	115	160	11444
9 15 "	3186550	1850	"	275	115	160	....
9 45 "	3188120	1570	"	275	115	160	....
10 15 "	3190010	1890	"	275	115	160	....
10.45 "	3191800	1790	"	275	115	160	24460
11 15 "	3193680	1880	"	275	115	160	....
11 45 "	3195400	1720	"	275	115	160	....
12.15 p.m.	3197130	1730	"	275	115	160	....
12.45 "	3198870	1740	"	275	115	160	....
1.15 "	3200690	1820	"	275	115	160	....
1.45 "	3202300	1610	"	275	115	160	44555
2.15 "	3204240	1940	"	275	115	160	....
2.45 "	3205920	1680	"	275	115	160	....
3.15 "	3207670	1750	"	275	115	160	....
3.45 "	3209630	1960	"	275	115	160	....
4 15 "	3211400	1770	"	275	115	160	....
4.45 "	3213330	1930	"	275	115	160	....
5.15 "	3215110	1780	"	275	115	160	....
5.45 "	3217020	1910	"	275	115	160	....
6.15 "	3219120	2100	"	275	115	160	....
6.45 "	3221010	1890	"	275	110	165	....
7.15 "	3222830	1820	"	275	110	165	....
7.45 "	3224860	2030	"	275	110	165	....
8.15 "	3226755	1895	"	275	110	165	....
8 45 "	3228570	1815	"	275	110	165	....
9 15 "	3230520	1950	"	275	110	165	....
9.45 "	3232218	1698	"	275	110	165	....
10 15 "	3234060	1842	"	275	110	165	....
10.45 "	3235990	1930	"	275	110	165	....
11.15 "	3237755	1765	"	275	110	165	....
11 45 "	3239550	1795	"	275	110	165	....
12 15 a.m.	3241180	1630	"	275	110	165	....
12.45 "	3243010	1830	"	275	110	165	....
1 15 "	3244890	1880	"	275	110	165	....
1 45 "	3246790	1960	"	275	110	165	....
2.15 "	324867[illegible]	1880	"	275	110	165	27400
2 45 "	325070[illegible]	2030	"	275	110	165	....
3 15 "	325259[illegible]	1890	"	275	110	165	....
3.45 "	3254400	1810	"	275	110	165	....
4.15 "	3256300	1900	"	275	110	165	....
4 45 "	3258240	1940	"	275	110	165	....
5 15 "	3260060	1820	"	275	105	170	....
5.45 "	3261930	1870	"	275	105	170	....
6 15 "	3263890	1960	"	275	105	170	....
6 45 "	3265760	1870	"	275	105	170	....
7 15 "	3267720	1960	"	275	105	170	....
7 45 "	3269630	1910	"	275	105	170	....
8 15 "	3271530	1900	"	275	105	170	....
8.45 "	3273160	1630	"	275	105	170	70188

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—April 8 and 9, 1909. **Trial Number—41.**

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
								lbs.	lbs.	
8.45 a.m.	55	[illegible]	6·20	20·12	1600	117·7	8.45 a.m.			
9.15 "	57	[illegible]	5·90	22·31	1600	124·5	8.55 "	75	75	
9.45 "	58	[illegible]	5·68	19·38	1620	105·4	9.45 "	50	125	
10.15 "	59	[illegible]	6·01	20·19	1615	108·8	11.00 "	25	150	
10.45 "	60	[illegible]	5·90	19·39	1670	107·0	11.30 "	50	200	
11.15 "	62	[illegible]	6·17	16·21	1685	100·4	12.30 p.m.	50	250	
11.45 "	63	[illegible]	6·00	17·19	1660	110·4	1.30 "	50	300	
12.15 p.m.	64	[illegible]	6·26	16·93	1670	106·0	2.30 "	50	350	
12.45 "	63	[illegible]	5·93	17·42	1660	113·4	3.30 "	50	400	
1.15 "	64	[illegible]	5·80	16·73	1780	115·6	4.45 "	50	450	
1.45 "	65	[illegible]	6·27	16·79	1740	108·7	5.50 "	50	500	
2.15 "	66	[illegible]	6·12	16·76	1750	110·8	6.50 "	50	550	
2.45 "	65	[illegible]	5·90	16·75	1720	111·0	8.00 "	50	600	
3.15 "	64	[illegible]	6·08	16·05	1770	105·0	9.20 "	50	650	
3.45 "	65	[illegible]	6·18	16·85	1770	112·3	10.20 "	50	700	
4.15 "	64	[illegible]	5.92	15·54	1785	101·9	11.20 "	50	750	12.30 a.m.
4.45 "	64	[illegible]	5·96	16·38	1790	110·9	12.30 a.m.	50	800	
5.15 "	63	[illegible]	6·05	16·23	1775	107·5	1.45 "	50	850	
5.45 "	64	[illegible]	5·42	15·28	1800	100·1	3.00 "	50	900	3.00 a.m.
6.15 "	64	[illegible]	5·80	16·49	1750	111·2	4.00 "	50	950	
6.45 "	64	[illegible]	6·08	15·30	1825	100·0	5.00 "	50	1000	
7.15 "	63	[illegible]	6·07	15·91	1825	106·7	6.10 "	50	1050	
7.45 "	65	[illegible]	6·83	16·45	1600	104·6	7.10 "	50	1100	
8.15 "	66	[illegible]	7·09	17·66	1775	112·0	8.10 "	25	1125	8.00 a.m.
8.45 "	66	[illegible]	6·22	17·72	1730	112·2				
9.15 "	65	7/12	6·41	16·98	1605	115·2				
9.45 "	66	[illegible]	6·68	17·10	1760	109·0				
10.15 "	67	[illegible]	6·48	16·18	1755	101·0				
10.45 "	68	[illegible]	6·97	17·44	1755	109·0				
11 15 "	68	[illegible]	6·94	16·48	1760	99·7				
11.45 "	69	[illegible]	6·80	17·71	1725	111·0				
12.15 a.m.	70	[illegible]	7·22	17·07	1735	102·3				
12.45 "	70	[illegible]	7·00	18·11	1690	111·6				
1.15 "	70	[illegible]	6·95	17·21	1740	106·0				
1.45 "	67	[illegible]	6·45	16·28	1750	102·1				
2.15 "	69	[illegible]	7·23	16·93	1800	103·8				
2.45 "	70	[illegible]	7·59	17·29	1805	103·8				
3.15 "	70	[illegible]	7·86	18·47	1770	111·6				
3.45 "	68	[illegible]	6·97	16·70	1775	102·7				
4.15 "	68	[illegible]	7·36	16·98	1775	101·5				
4.45 "	69	[illegible]	7·79	17·52	1750	101·3				
5.15 "	68	[illegible]	7·41	17·34	1730	102·1				
5.45 "	70	[illegible]	7·81	17·48	1740	100·0				
6.15 "	70	[illegible]	7·85	18·42	1660	104·3				
6.45 "	70	[illegible]	7·54	17·49	1665	98·5				
7.15 "	70	[illegible]	7·86	18·96	1600	105·6				
7.45 "	69	[illegible]	7·51	18·14	1600	101·1				
8.15 "	69	[illegible]	7·64	19·47	1600	112·4				
8.45 "										

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—April 8 and 9, 1909. Trial Number—41.

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.45 a.m.	560	56	59	100	4·2	8·2	8·4	4·9	3·1	0·7	74	70
9.15 "	660	58	63	123	4·0	7·7	7·9	5·4	3·8	1·2	70	63
9.45 "	680	60	64	144	3·3	5·2	5·7	4·8	4·0	1·3	60	47
10.15 "	720	62	65	128	3·4	5·4	5·6	5·4	3·8	1·1	62	48
10.45 "	660	62	65	127	3·4	5·4	5·6	5·0	3·5	1·0	68	64
11.15 "	660	64	66	139	3·6	6·2	6·4	5·3	3·8	1·3	62	57
11.45 "	660	64	67	135	3·4	5·8	6·0	6·3	4·8	2·5	64	57
12.15 p.m.	710	66	68	136	3·5	5·9	6·1	5·5	4·0	1·[illegible]	68	62
12.45 "	710	66	66	138	3·5	5·8	6·0	5·7	4·2	1·8	63	56
1.15 "	740	66	67	135	3·7	6·4	6·6	6·1	4·7	2·2	68	60
1.45 "	690	68	69	147	3·3	5·3	5·5	5·4	4·0	1·5	68	62
2.15 "	730	68	70	152	4·0	7·6	7·8	6·1	4·6	2·3	64	58
2.45 "	710	68	67	149	3·5	5·8	6·0	6·2	4·6	2·4	68	61
3.15 "	740	68	65	149	3·9	7·2	7·4	6·4	5·0	2·6	70	64
3.45 "	720	68	66	141	3·5	5·4	5·6	5·5	4·0	1·5	70	63
4.15 "	740	68	65	120	3·7	6·4	6·6	6·1	4·6	2·1	58	51
4.45 "	750	68	65	119	3·7	6·2	6·4	5·9	4·4	2·0	59	51
5.15 "	790	68	65	118	4·2	8·2	8·4	6·7	5·1	2·5	65	58
5.45 "	760	68	66	118	3·7	6·4	6·6	6·2	4·6	2·1	68	60
6.15 "	810	68	66	118	4·6	8·8	9·0	7·7	5·0	2·5	70	63
6.45 "	740	68	68	118	3·6	6·3	6·5	5·9	4·4	2·0	67	61
7.15 "	760	68	64	120	3·9	7·1	7·3	6·6	5·0	2·5	70	63
7.45 "	770	68	69	125	3·9	7·3	7·5	6·6	5·0	2·7	70	62
8.15 "	760	69	72	127	3·5	5·9	6·1	6·0	4·5	2·1	63	55
8.45 "	770	70	70	126	3·8	6·7	6·9	6·4	4·8	2·3	64	52
9.15 "	770	69	66	120	3·8	6·9	7·1	6·2	4·6	2·2	70	62
9.45 "	760	70	70	119	3·8	6·7	6·9	6·6	5·0	2·7	69	62
10.15 "	760	70	70	118	4·0	7·9	8·1	7·0	5·3	2·7	71	66
10.45 "	760	71	73	123	3·7	6·5	6·7	6·8	5·3	2·8	62	56
11.15 "	730	72	73	121	3·4	5·4	5·6	6·2	4·7	2·4	68	60
11.45 "	760	72	73	119	3·7	6·5	6·7	7·0	5·5	3·2	71	64
12.15 a.m.	730	72	74	135	3·4	5·7	5·9	6·3	5·0	2·6	68	60
12.45 "	760	72	73	145	3·8	6·3	6·5	7·1	5·7	3·3	68	60
1.15 "	770	72	72	146	3·7	6·5	6·7	6·8	5·5	2·9	64	56
1.45 "	770	71	67	148	3·9	7·1	7·3	6·5	5·0	2·7	63	55
2.15 "	760	72	72	148	3·9	7·1	7·3	7·0	5·7	3·0	68	63
2.45 "	770	72	73	148	3·9	7·0	7·2	7·2	5·8	3·2	57	48
3.15 "	750	72	74	148	3·8	6·2	6·4	6·6	5·1	2·8	69	62
3.45 "	760	72	68	149	3·7	6·1	6·3	6·7	5·3	2·3	70	63
4.15 "	800	70	65	150	4·2	8·2	8·4	8·3	7·1	4·4	69	62
4.45 "	750	71	72	155	3·6	5·6	5·8	6·4	5·0	2·6	63	56
5.15 "	760	70	70	138	3·8	6·5	6·7	6·5	5·2	2·8	67	60
5.45 "	760	70	72	140	3·8	6·5	6·7	6·6	5·1	2·8	63	56
6.15 "	760	70	73	135	3·8	6·2	6·4	6·5	5·0	2·8	68	60
6.45 "	760	70	74	140	3·9	6·8	7·0	7·0	5·5	3·0	62	55
7.15 "	760	70	73	138	3·8	6·5	6·7	6·5	5·0	2·7	66	59
7.45 "	760	70	70	145	3·8	6·4	6·6	6·6	5·0	2·8	63	56
8.15 "	780	69	70	146	3·8	6·4	6·6	6·7	5·5	2·8	57	66
8.45 "	700	69	71	145	3·3	5·0	5·2	5·5	4·0	1·5	60	53

PRODUCER TRIAL No. 41.

Date—April 8-9, 1909. Producer No. 4, at McGill University.

Time of lighting up—2.05 a.m. Trial commenced 8.45 a.m., April 8; ended 8.45 a.m., April 9.

Duration of trial—24 hours. Kind of fuel—No. 23 M coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Cameron, Killam.

Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	11·25
2.	Moisture in coal as charged	per cent.	1.0
3.	Calorific value of coal as charged, per lb	B.T.U.	12950
4.	" " of dry coal per lb	B.T.U.	13080
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 77·7; volatile matter, 11·4; ash, 9·9; moisture, 1·0	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 46·2; volatile matter, 4·4	Total per cent.	50·6
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	41·3

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	88460
9.	Average temperature of gas leaving producer	°F.	699
10.	" " " at meter	°F.	69
11.	Average temperature of air in producer house	°F.	68
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	107·0
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	111·0
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	102·1
14.	Average barometric pressure	lbs. sq in.	14·48
15.	" suction at producer	ins. of water	23·5
16.	" suction at exhauster	ins. of water	6·3
17.	" pressure of gas at meter	ins. of water	5·1

STEAM, WATER, ETC.

18	Total steam used in producer during trial	lbs.	27·10
19.	" water used in scrubber and gas washer	lbs.	287·50
20.	" tar extracted in scrubber and gas washer	lbs.	6
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	....

ENGINE.

23.	Total revolutions during trial (from counter)		317,488
24.	Average explosions per minute		106·9
25.	Average effective load on brake	lbs.	163·6
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	58·47

28. **Notes.**

Fire poked at: 12.30, 3.00, 8.00.
Refuse removed at: 11.45 a.m.; 4.00, 5.00 p.m.; 3.00, 5.00, 7.15 a.m.
Behaviour of coal: Works well in producer, burns to fine ash.
Average time between poking: 8 hours
Clinker: No trouble.
Tar: No trouble, very little was formed.
State of engine valves at end of trial: Did not need cleaning.
Valves last cleaned: March 30, 1909.

29. ANALYSIS OF DRY COAL.

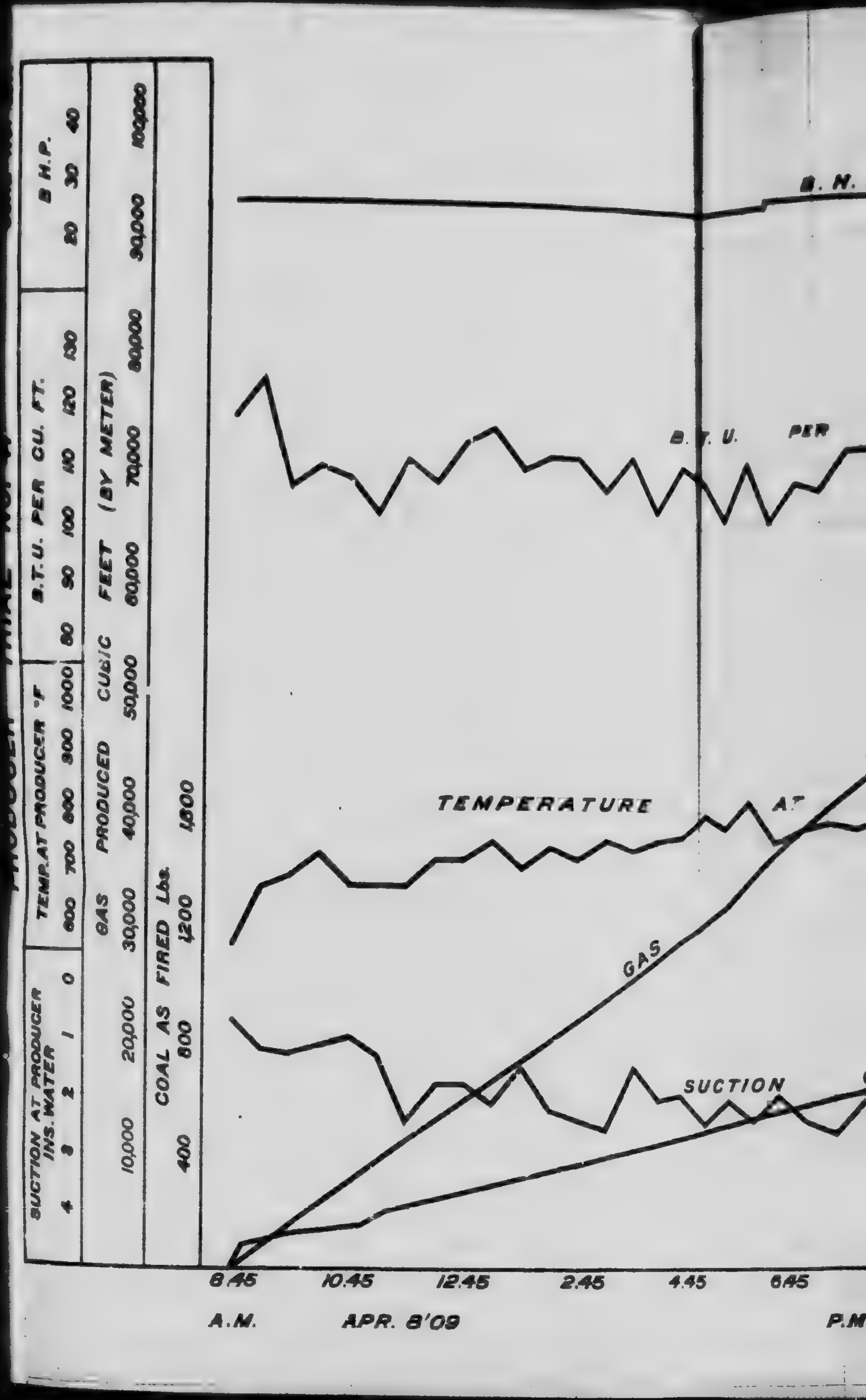
Hydrogen	3·6%
Carbon	76·6%
Nitrogen	1·0%
Oxygen	4·1%
Sulphur	0·6%
Total carbon contained by dry coal charged	854·0 lbs.

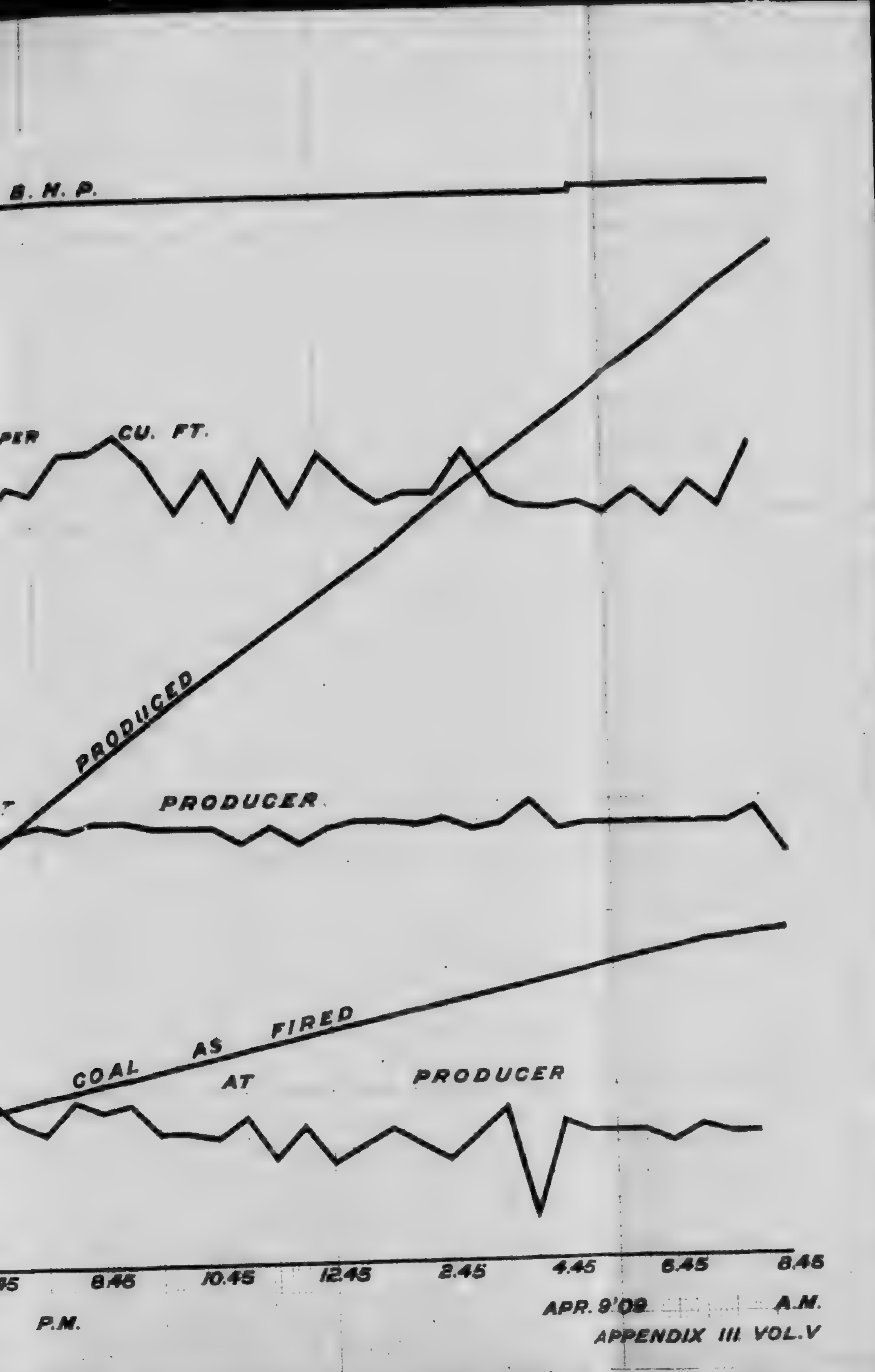
30. ANALYSIS OF GAS BY VOLUME.

Carbon dioxide	11·7%
Oxygen	0·2%
Carbon monoxide	12·8%
Hydrogen	13·1%
Methane	2·2%
Ethylene	0·0%
Nitrogen	60·0%

PRODUCER TRIAL NO. 41

COAL NO. 23M


PRODUCER TRIAL
SUCTION AT PRODUCER INS. WATER
4 3 2 1 0
TEMP. AT PRODUCER °F
600 700 800 900 1000
B.T.U. PER CU. FT.
80 90 100 110 120 130
B.H.P.
20 30 40
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1200 1600
B. H.
B. T. U. PER
TEMPERATURE AT
GAS
SUCTION
8.45
10.45
12.45
2.45
4.45
6.45
A.M.
APR. 8'09
P.M.



APPENDIX III VOL.V

1
1
1

1

1

1
1
1
1

1
1
2
21
2

2
24
25
2
27

28

29

REMARKS.

Required no poking to speak of, the fire being perfectly free. A large quantity of steam was used. The refuse removed was very fine and well burnt.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1114
32.	Combustible charged during trial	lbs.	1002
33.	Average B.H.P. of engine during trial	H.P.	26·34
34.	" indicated H.P. of engine during trial	H.P.	35·83
35.	" H.P. taken by exhauster and gas washer	H.P.	2·5
36.	" B.H.P. while gas consumption of engine was taken	H.P.	26·34
37.	" " corresponding to total gas produced	H.P.	26·34
38.	" " " " " " and available for outside use, allowing for power used	H.P.	23·84

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	46·8
40.	Dry coal charged per hour	lbs.	46·4
41.	Combustible charged per hour	lbs.	41·8
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	11·7
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	11·6
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	10·5
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	4·45
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	14·53
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3686
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3550
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3686
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3550
51	Calorific value of coal charged per hour	B.T.U.	606000
52.	" " gas produced per hour (lower value)	B.T.U.	362100
53.	Steam used in producer per hour	lbs.	112·7

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	75·9
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	76·5
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	84·9
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I H.P. per hr	cub. ft.	99·0
58.	" " " " " " B.H.P. "	cub. ft.	134·8
59.	Steam used in producer per lb. coal charged	lbs.	2·41
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	25·6
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	325·2
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	59·9
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	54·4
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	41·4
65.	Thermal efficiency of engine, based on B.H.P	per cent.	18·5
66.	Over all efficiency of producer and engine plant	per cent.	11·06
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	13760
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	23000

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·78	1·76	1·59
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	1·96	1·94	1·75
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·57	2·54	2·29

NICOLA VALLEY COAL FIELD.

BRITISH COLUMBIA.

TRIAL OF No. 4 PRODUCER WITH COAL No. 22 M.

Date—January 7 and 8, 1909.

Trial Number—18.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	30·22 inches
" " 9.10 p.m.	30·45 "
" " end of trial	30·40 "
Water meter at 9.55 p.m., Jan. 7	51,542 imperial gallons.
" " 8.25 a.m., " 8	53,044 " "
Difference, in 22½ hours	1,502 " "
Brick in producer base	1,190 lbs.
Average level of coal below top plate of producer	20 inches.

TIME.		
3 30	a.m., Jan. 7	Fire started with 10 lbs. of shavings, 30 lbs. of wood, 120 lbs. of coke.
4 30	" " "	50 lbs. of coal charged.
5.15	" " "	100 " " "
6.00	" " "	Down-draft with fan exhausting directly to atmosphère.
6 15	" " "	75 lbs. of coal charged.
6 30	" " "	50 " " "
7.00	" " "	75 " "
8 00	" " "	75 " "
9.10	" " "	Trial commenced.
9.35	" " "	Turned on steam in producer.
10.05	" " "	Engine started.
10.30	" " "	Engine stopped owing to a hot bearing.
11.30	" " "	Engine restarted.
		Considerable difficulty with revolution counter throughout trial.
9 10	a.m., Jan. 8	Trial finished.

At end of trial valves were sticky with tar, as were also the gas washer and exhauster.

Wet refuse removed during the trial from the producer	970 lbs.
100 lbs. of this when dried weighed	74 "
Wet refuse removed after the trial	1,470 "
100 lbs. of this when dried weighed	61 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 7 and 8, 1909. Trial Number—18.

Note: R. and P. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.10 a.m.	8·9	0·9	0·7	6·9	6·2	5·2	72·1	18·1
11.45 "	12·2	0·1	0·3	9·3	5·5	6·0	66·6	21·1
2.00 p.m.	10·7	0·3	0·1	12·6	3·5	9·9	62·9	26·1
3.00 "	10·0	0·2	0·2	13·6	5·6	16·0	54·4	35·4
5.00 "	11·2	0·3	0·0	12·7	3·2	13·7	58·9	29·6
6.10 "	10·9	0·4	0·3	11·5	5·0	14·0	57·9	30·8
7.10 "	9·2	0·3	0·5	10·8	5·1	17·5	56·6	33·9
8.10 "	10·2	0·1	0·3	10·1	4·5	18·0	56·8	32·9
9.10 "	9·1	0·3	0·3	10·4	5·6	15·2	59·1	31·5
9.30 "	10·0	0·5	1·5	7·3	8·8	10·8	61·1	28·4
10.05 "	9·3	0·1	1·8	9·8	10·3	11·8	56·9	33·7
10.15 "	8·6	0·1	1·9	11·0	11·2	14·4	52·8	38·5
10.45 "	8·6	0·1	1·9	10·2	12·4	11·9	54·9	36·4
12.10 a.m.	9·3	1·2	0·5	10·1	5·3	11·0	62·6	26·9
1.10 "	8·6	0·4	0·3	12·7	4·3	12·1	61·6	29·4
2.10 "	14·8	0·4	0·0	11·2	3·0	11·4	59·2	25·6
3.10 "	12·5	0·5	0·1	11·4	3·6	11·3	60·6	26·4
4.15 "	10·0	0·2	1·1	10·8	9·0	9·5	59·4	30·4
8.25 "	9·5	2·6	0·5	8·7	4·6	1·7	72·4	15·5

OBSERVATIONS OF GAS METER AND B.H.P.

Date—January 7 and 8, 1909.

Trial Number—18.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to gas engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
9.10 a.m.	1336310							
9.40 "	1337720	1410	B.O.					
10.10 "	1339105	1385	"					
10 40 "	1340550	1445	"					
11 10 "	1342045	1495	"					
11.40 "	1343490	1445	"					
12.10 p.m.	1344970	1480	N.B.O.					
12.40 "	1346645	1675	"	12.40 p.m.	275	105	170	00538
1.10 "	1348425	1780	"	...	275	105	170	
1.40 "	1350195	1770	"	...	275	105	170	
2.10 "	1351990	1795	"	...	275	105	170	
2.40 "	1353720	1730	"	2.40 p.m.	275	105	170	10111
3.10 "	1355515	1795	"	...	300	125	175	
3.40 "	1357185	1670	"	...	300	125	175	
4.10 "	1358840	1655	"	...	300	25	175	
4.40 "	1360470	1630	"		300	5	175	
5.10 "	1362150	1680	"		300	5	175	
5 40 "	1363895	1745	"		300	125	175	
6.10 "	1365650	1755	"	6.10 p.m.	300	120	180	
6.40 "	1367350	1700	"		300	120	180	35924*
7.10 "	1369030	1680	"	...	300	120	180	
7.40 "	1370660	1630	"	...	300	120	180	
8.10 "	1372310	1650	"	...	300	120	180	
8.40 "	1373845	1535	"	...	300	120	180	
9.10 "	1375260	1415	"	9.10 p.m.	300	115	185	
9.40 "	1376540	1280	"	9.50 p.m.	Engine load	running	with no	55467
10.10 "	1377855	1315	"	10.10 p.m.	300	115	185	
10.40 "	1379210	1355	"	...	300	115	185	
11.10 "	1380570	1360	"	...	300	115	185	
11.40 "	1381855	1285	"	11.40 p.m	300	115	185	
12.10 a m	1383285		"	12.10 a.m	275	105	175	66595
12.40 "	1384680	1395	"	12.40 a.m	250	95	105	
1.10 "	1386225	1545	"	...	250	95	105	
1.40 "	1387780	1555	B.O.	...	250	95	105	
2.10 "	1389435	1655	N.B.O.	...	250	95	105	
2.40 "	1391030	1595	"	...	250	95	105	
3.10 "	1392555	1525	"	3.10 a.m.	250	95	155	
3.40 "	1394055	1500	"	3.40 "	250	90	160	89700
4.10 "	1395345	1290	"	...	250	90	160	
4.40 "	1396700	1355	"	...	250	90	160	
5.10 "	1398040	1340	"	...	250	90	160	
6.10 "	1400895	2855	"	6.30 a.m.	Engine	running	with no	load.
6.40 "	1402190	1295	"	6.40 "	250	90	160	13092
7.10 "	1403635	1445	"	7.10 "	250	90	160	13092
7.40 "	1404930	1295	"	7.40–8.40	a.m.	Engine	running	light.
8.10 "	1406250	1320	"	...				
8.40 "	1407455	1205	"	8.40 "	250	90	160	
9.10 "	1408695	1240	"	9.10 "	250	90	160	16690

*Counter was not recording from 6.40 to 9.50 p.m.

OBSERVATIONS OF GAS CALORIMETER AND COAL.

Date—January 7 and 8, 1909. **Trial Number—18.**

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent. Inlet	Water Temp. Deg. Cent. Outlet	Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
								lbs.	lbs.	
9.10 a.m.	53	$\frac{2}{3}$	9·01	24·24	1705	154·4	9.10 a.m.	25	25	9 15 a.m.
9.40 "	53	$\frac{2}{3}$	5·87	16·47	1650	104·0	9.40 "	50	75	....
....	....	....	....	....	....	....	10.15 "	50	125	10 10 "
10.40 "	54	$\frac{5}{12}$	5·85	12·39	1772	110·0	....	....	....	....
11.10 "	55	$\frac{1}{4}$	6·67	11·51	1600	122·7	11.10 "	75	200	10.55 "
11.40 "	56	$\frac{1}{3}$	7·29	12·97	1680	113·5	11 55 "	50	250	
12.10 p.m.	58	$\frac{5}{12}$	7·43	15·30	1610	120·6	12 30 p.m.	50	300	11.35 "
12.40 "	59	$\frac{1}{3}$	7·28	13·82	1600	124·3	12.50 "	50	350	12 05 p.m.
1.10 "	59	$\frac{1}{2}$	7·87	17·93	1640	124·2	....	....	....	
1.40 "	62	$\frac{1}{2}$	7·26	16·78	1640	110·6	1.50 "	50	400	1 45 "
2.10 "	62	$\frac{5}{12}$	8·43	16·14	1609	117·8	....	....	....	
2.40 "	64	$\frac{5}{12}$	8·52	16·52	1600	122·6	2.35 "	50	450	
3.10 "	65	$\frac{5}{12}$	8·55	16·12	1700	122·3	3.10 "	50	500	3.05 "
3.40 "	66	$\frac{5}{12}$	8·58	16·68	1705	131·3	3.35 "	50	550	....
4.10 "	66	$\frac{5}{12}$	7·34	15·60	1760	138·2	....	....	....	4.05 "
4.40 "	65	$\frac{1}{3}$	7·03	13·50	1690	130·0	4.35 "	50	600	....
5.10 "	67	$\frac{1}{3}$	7·54	12·78	1930	120·3	5.20 "	50	650	....
5.40 "	67	$\frac{1}{4}$	7·87	12·74	1600	123·5	....	....	....	....
6.10 "	68	$\frac{1}{4}$	8·10	12·10	1810	124·0	6.05 "	50	700	
6.40 "	68	$\frac{1}{3}$	8·59	15·34	1580	126·7	6.40 "	50	750	6.40 "
7.10 "	68	$\frac{1}{3}$	8·43	15·90	1770	157·0	7.10 "	50	800	7.10 "
7.40 "	68	$\frac{1}{3}$	7·93	16·36	1700	170·2	7 35 "	50	850	7.35 "
8 10 "	67	$\frac{4}{12}$	6·14	14·50	1600	157·6	8·00 "	50	900	8.00 "
8.40 "	67	$\frac{1}{3}$	5·96	13·99	1600	152·7	8.30 "	50	950	8.30 "
9.10 "	66	$\frac{1}{3}$	6·24	13·37	1600	135·6	9.07 "	50	1000	8.45 "
9.40 "	66	$\frac{1}{3}$	6·00	13·46	1660	147·2	9.30 "	25	1025	9.03 "
10.10 "	67	$\frac{1}{3}$	6·44	14·38	1810	170·7	9.55 "	50	1075	9.25
10.40 "	67	$\frac{5}{12}$	6·84	13·70	1675	109·3	10 30 "	50	1125	9.40 "
11.10 "	67	$\frac{5}{12}$	6·73	18·95	1600	186·0	10.55 "	50	1175	9.55 "
11 40 "	67	$\frac{1}{2}$	7·00	18·29	1795	174·7	11.15 "	50	1225	10.05 "
12.10 a.m.	67	$\frac{1}{2}$	6·91	15·37	1730	116·0	11.45 "	50	1275	10.43 "
12.40 "	67	$\frac{1}{3}$	6·92	16·13	1730	126·3	12.10 a.m.	50	1325	10.50 "
1.10 "	69	$\frac{5}{12}$	6·90	14·85	1682	127·0	12.40 "	50	1375	11.10
1.40 "	69	$\frac{5}{12}$	7·23	13·00	1875	102·8	1.10 "	50	1425	11.35
2 10 "	69	$\frac{1}{2}$	7·10	14·42	1650	102·1	2.15 "	50	1475	12.05 a.m.
2.40 "	69	$\frac{1}{2}$	7·25	15·85	1600	121·8	....	....	....	12 35
3.10 "	69	$\frac{1}{2}$	7·33	19·09	1600	149·0	3.10 "	50	1525	1 05
3.40 "	69	$\frac{1}{2}$	7·50	19·87	1600	156·8	3.30 "	75	1600	1 50
4.10 "	69	$\frac{7}{12}$	7·66	17·10	1800	115·4	....	....	....	3·05
4.40 "	69	$\frac{1}{2}$	7·50	17·78	1600	128·7	4.40 "	50	1650	3.30
5.10 "	69	$\frac{1}{2}$	7·20	16·20	1600	113·2	5.10 "	50	1700	4 40
5.40 "	....	....	....	....	....	....	5.30 "	50	1750	4 45
6.10 "	69	$\frac{5}{12}$	7·75	16·15	1610	128·7	6.10 "	50	1800	5 30 "
6.40 "	69	$\frac{5}{12}$	8·15	19·69	1600	175·5	6.40 "	50	1850	6 05
7.10 "	69	$\frac{5}{12}$	8·02	16·16	1785	138·0	....	....	....	6.35
7.40 "	69	$\frac{1}{4}$	7·89	12·97	1455	118·0	7.35 "	75	1925	7 30
8.10 "	....	....	....	....	....	....	8.25 "	75	2000	8.20
8.40 "	69	$\frac{5}{12}$	7·92	15·61	1750	127·9	8.40 "	75	2075	

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—January 7 and 8, 1909.

Trial Number—18.

Time.	Temperatures, °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
9 10 a.m.	600	53	52	....	3·4	4·5	4·7	7·1	6·8	2·7	..	..
9 40 "	660	54	55	....	3·6	4·1	4·3	8·7	8·1	3·5	69	66
10 10 "	700	55	57	....	3·4	4·8	5·0	8·4	7·6	2·2	67	65
10 40 "	680	57	58	....	3·2	4·3	4·5	8·5	7·7	2·5	69	66
11 10 "	720	58	60	....	3·1	4·3	4·5	8·0	7·5	1·7	72	79
11.40 "	750	59	60	....	3·6	5·0	5·2	7·9	7·0	1·3	71	68
12.10 p.m.	720	61	63	....	3·3	4·9	5·1	8·3	7·6	1·6	70	67
12 40 "	790	63	66	114	3·7	5·7	5·9	10·0	9·1	0·8	75	68
1 10 "	800	64	67	133	3·6	5·8	6·0	9·7	8·8	0·8	62	39
1 40 "	810	66	70	138	3·6	6·0	6·2	9·7	8·8	0·8	67	60
2 10 "	770	67	70	135	3·6	5·8	6·0	9·5	8·8	1·2	61	55
2 40 "	800	68	70	142	3·7	6·0	6·2	10·0	9·2	1·1	65	55
3 10 "	790	68	72	146	3·6	5·8	6·0	9·2	8·2	1·8	57	47
3.40 "	790	69	70	151	3·6	5·6	5·8	9·3	8·7	1·8	48	38
4 10 "	800	69	70	151	3·5	4·6	4·8	9·0	8·2	1·5	48	38
4 40 "	780	68	68	132	3·6	3·1	5·3	9·6	8·7	2·0	47	37
5 10 "	790	68	70	138	3·5	5·8	6·0	10·0	9·3	2·3	44	35
5 40 "	800	68	70	133	3·5	5·8	6·0	10·2	9·7	2·4	49	39
6 10 "	800	69	72	130	3·5	5·8	6·0	9·9	9·1	1·9	38	28
6 40 "	790	70	72	140	3·6	6·0	6·2	10·3	9·6	2·8	48	39
7 10 "	810	71	72	140	3·5	5·8	6·0	10·1	9·3	2·2	31	23
7 40 "	820	72	72	143	3·4	4·9	5·1	10·1	9·4	2·4	46	37
8 10 "	820	70	61	141	3·6	4·9	5·1	10·2	9·7	2·5	36	31
8 40 "	770	68	66	148	3·3	4·8	5·0	11·0	10·4	4·6	30	30
9 10 "	750	69	67	140	3·2	4·6	4·8	9·4	8·9	3·0	31	27
9 40 "	740	70	68	130	3·5	5·0	5·2	10·1	9·2	3·4	41	33
10 10 "	730	70	70	105	3·4	4·9	5·1	10·0	9·1	2·8	60	57
10 40 "	700	71	70	121	3·3	8·2	5·4	11·7	11·0	4·4	71	68
11 10 "	750	72	70	133	3·2	5·1	5·3	12·0	11·3	3·1	63	60
11 40 "	740	73	72	132	3·2	4·8	5·0	10·4	9·8	3·0	60	57
12 10 a.m.	700	73	72	130	3·3	4·8	5·0	11·3	11·0	4·4	50	47
12 40 "	710	74	72	130	3·4	5·1	5·3	10·0	9·3	2·7	56	54
1 10 "	720	74	72	128	3·4	5·2	5·4	11·1	10·3	2·9	67	65
1 40 "	750	74	72	128	3·4	5·4	5·6	11·2	10·2	2·5	53	50
2 10 "	740	74	72	128	3·8	5·8	6·0	11·0	9·9	2·5	50	15
2 40 "	780	74	72	122	3·4	5·3	5·5	11·0	9·9	2·2	46	10
3 10 "	800	74	72	128	3·4	5·0	5·2	10·8	9·7	2·0	35	5
3 40 "	780	74	71	120	3·2	4·4	4·6	8·4	7·3	1·9	35	12
4 10 "	740	71	71	120	3·2	4·6	4·8	9·2	8·3	1·9	34	13
4 40 "	750	74	70	123	3·2	4·6	4·8	9·2	8·4	2·1	29	10
5 10 "	720	74	70	121	3·0	4·0	4·2	8·7	8·1	1·8	36	31
6 10 "	700	74	70	112	3·3	4·7	4·9	12·4	11·6	4·0	40	38
6 40 "	780	74	70	112	3·4	4·9	5·1	10·7	9·8	2·2	36	35
7 10 "	720	74	70	117	3·3	4·6	4·8	10·8	10·0	2·7	34	[illegible]
7 40 "	700	75	70	110	3·2	4·1	4·3	10·5	9·5	3·3	74	
8 10 "	700	75	71	128	3·2	4·5	4·7	11·8	10·7	3·5	65	62
8 40 "	680	75	69	136	3·1	4·6	4·8	12·7	11·8	3·5	63	69
9 10 "	700	75	70	135	3·2	4·9	5·1	11·6	10·7	3·5	59	56

PRODUCER TRIAL No. 18.

Date—January 7-8, 1909. Producer No. 4, at McGill University.

Time of lighting up—3.30 a.m. Trial commenced 9.10 a.m., January 7; ended 9.10 a.m., January 8.

Duration of trial—24 hours. Kind of fuel—No. 22 M coal.
Observers and staff during trial—Cameron, Killam, Gardner
Computers—Killam, Cameron.
Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial	lbs.	2075
2.	Moisture in coal as charged	per cent.	3·2
3.	Calorific value of coal as charged, per lb	B.T.U.	11340
4.	" " of dry coal per lb	B.T.U.	11720
5	Proximate analysis of coal as charged (by weight): fixed carbon, 47·8; volatile matter, 36·2; ash, 12·8; moisture, 3·2	per cent	
6.	Combustible in dry refuse removed during trial: fixed carbon, 64·7; volatile matter, 5·7	Total per cent.	70·4
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	40

Gas.

8.	Total gas produced during trial (from meter readings)	cub. ft.	72385
9.	Average temperature of gas leaving producer	°F	740
10.	" " " at meter	°F.	70
11.	Average temperature of air in producer house	°F.	71
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	132·3
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	136·4
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	122·9
14.	Average barometric pressure	lbs. sq in.	14·85
15.	" suction at producer	ins. of water	2·5
16.	" suction at exhauster	ins. of water	10·00
17.	" pressure of gas at meter	ins. of water	4·22

Steam, Water, Etc.

18.	Total steam used in producer during trial	lbs.	2940
19.	" water used in scrubber and gas washer	lbs.	21760
20.	" tar extracted in scrubber and gas washer	lbs.	
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·0

Engine.

23.	Total revolutions during trial—counter out of order		
24.	Average explosions per minute		104
25.	Average effective load on brake	lbs.	150·4
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	69·46

28. **Notes.**

Fire poked at: Every 40 minutes on the average.
Refuse removed at: Every hour on the average.
Behaviour of coal: Required considerable poking.
Average time between poking: 40 minutes
Clinker: No record of difficulties from clinker
Tar: Engine stopped during trial by tar
State of engine valves at end of trial: required cleaning
Valves last cleaned: Dec. 9, 1908

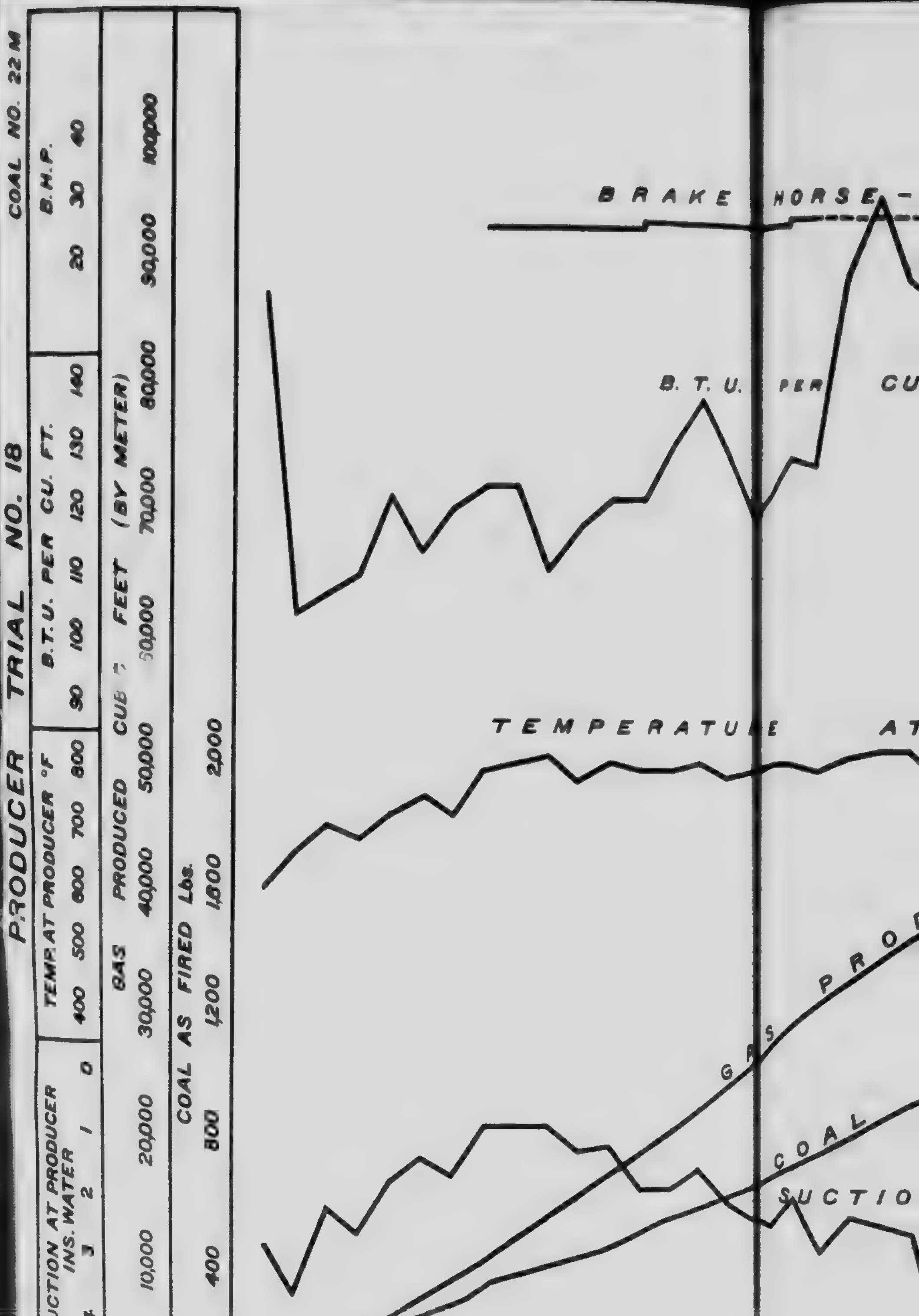
29. ANALYSIS OF DRY COAL.

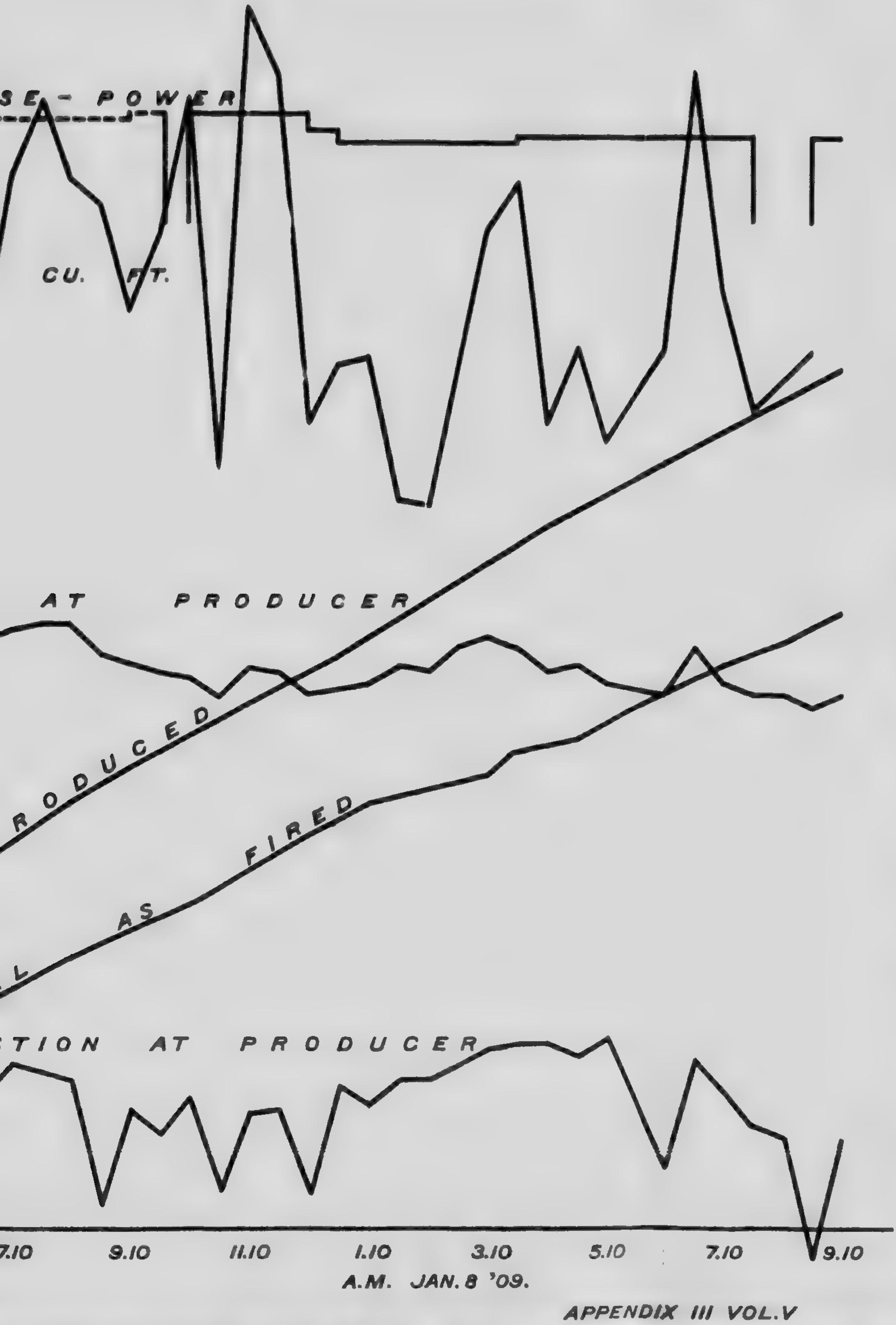
Hydrogen	4·9%
Carbon	66·1%
Nitrogen	1·4%
Oxygen	12·6%
Sulphur	0·9%
Total carbon contained by dry coal charged	1328·0 lbs.

30. ANALYSIS OF GAS BY VOLUME

Carbon dioxide	10·74%
Oxygen	0·50%
Carbon monoxide	11·80%
Hydrogen	12·30%
Methane	6·48%
Ethylene	0·68%
Nitrogen	57·50%

PRODUCER TRIAL NO 18 COAL NO 22M


PRODUCER TRIAL NO. 18
COAL NO. 22 M
B.H.P. 20 30 40
B.T.U. PER CU. FT. 90 100 110 120 130 140
TEMP. AT PRODUCER °F 400 500 600 700 800
SUCTION AT PRODUCER INS. WATER 4 3 2 1 0
GAS PRODUCED CUB. FEET (BY METER) 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs. 400 800 1,200 1,600 2,000
BRAKE HORSE-
B. T. U. PER CU
TEMPERATURE AT
GAS PROD
COAL
SUCTION
9.10
11.10
1.10
3.10
5.10
7.10
A.M. JAN. 7 '09.



APPENDIX III VOL.V

REMARKS.

This coal requires considerable poking, steam and shaking, but it gives off a good gas. Coal consumption was high. Refuse had a rather slaty appearance, due to combustible in refuse removed. Repeat trial to be made.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	2009
32.	Combustible charged during trial	lbs.	1743
33.	Average B.H.P. of engine during trial	H.P.	....
34.	" indicated H.P. of engine during trial	H.P.	41·35
35.	" H.P. taken by exhauster and gas washer	H.P.	3·5
36.	" B.H.P. while gas consumption of engine was taken	H.P.	....
37.	" " corresponding to total gas produced	H.P.	.
38.	" " " " " " and available for outside use, allowing for power used	H.P.	....

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	86·5
40.	Dry coal charged per hour	lbs.	83·7
41.	Combustible charged per hour	lbs.	72·7
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	21·6
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	20·9
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	18·2
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	12·73
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	18·0
47.	Gas (oy meter) supplied by producer per hour	cub. ft.	3015
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	2925
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3365
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3265
51.	Calorific value of coal charged per hour	B.T.U.	980000
52.	" " gas produced per hour (lower value)	B.T.U.	360000
53.	Steam used in producer per hour	lbs.	122

ECONOMIC RESULTS.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	33·8
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	34·9
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	40·2
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I H.P. per hr.	cub. ft.	79·0
58.	" " " " " " B.H.P. "	cub. ft.	123·0
59.	Steam used in producer per lb. coal charged	lbs.	1·42
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	10·48
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	300·1
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	36·6
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	31·3
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	25·9
65.	Thermal efficiency of engine, based on B.H.P	per cent.	....
66.	Over all efficiency of producer and engine plant	per cent.	....
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	....
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	....

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	...	..	....
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	....	..	....
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	....	....	....

NOTE.—No value is given for the B.H.P. owing to the revolution counter being irregular.

TRIAL OF No. 4 PRODUCER WITH COAL No. 22 M.

Date—February 8 and 9, 1909. Trial Number—25.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	29·66 inches
" " 12 p.m., Feb. 8	30·02 "
" " at end of trial	30·09 "
Water meter reading at 9.00 a.m., Feb. 8	76,243 imperial gallons.
" " " 8.00 a.m., Feb. 9	79,343 " "
Difference, in 23 hours	3,098 " "
Brick in producer base	950 lbs.
Average level of fuel below the top plate of the producer	17·8 inches.

TIME.				
4.00	a.m.,	Jan.	8	Fire started with 10 lbs. of shavings, 30 lbs. of wood, and 150 lbs. of coke.
6.00	"	"	"	Down-draft with fan exhausting directly to the atmosphere.
6.30	"	"	"	Charged 150 lbs. of coal.
7.15	"	"	"	" 50 " "
8.00	"	"	"	" 50 " "
8.20	"	"	"	Down-draft with blower.
8.35	"	"	"	Started engine.
8.35	"	"	"	Charged 75 lbs. of coal.
8.40	"	"	"	Commenced trial.
12.00	"	"	"	Gas washer blown through with steam
7.00	p.m.,	"	"	" " " "
1.15	a.m.,	"	9	" " " "
8.40	"	"	"	Trial finished.

Valves on engine free from tar at the end of the trial, and did not need cleaning
29 lbs. of tar removed from the wet scrubber.
1 lb. of tar removed from the gas washer.
1,195 lbs. of wet refuse removed from the producer after the trial.
300 lbs. of this weighed 194 lbs. when dried.
505 lbs. of wet refuse removed during the trial.
226 lbs. of this refuse when dried weighed 143 lbs.

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—February 8 and 9, 1909.

Trial Number—25.

*Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.05 a.m.	10·2	1·3	0·6	10·7	2·6	13·4	61·2	27·3
10.00 “	10·8	1·2	0·1	10·5	3·0	10·2	64·2	23·8
11.00 “	9·9	1·2	0·2	11·6	2·5	10·6	64·0	24·9
12.00 p.m.	11·1	1·4	0·4	9·0	4·4	7·7	66·0	21·5
1.00 “	11·9	1·2	0·2	8·8	4·7	9·1	64·1	22·8
2.00 “	12·4	1·2	0·2	11·8	2·2	9·9	62·3	24·1
3.00 “	10·4	1·6	0·2	12·3	2·9	10·9	61·7	26·3
4.00 “	10·8	1·1	0·3	11·8	3·4	11·2	61·4	26·7
5.00 “	11·8	1·2	0·2	12·1	2·5	11·0	61·2	25·8
7 00 “	9·5	1·6	0·0	12·3	2·4	14·4	59·8	29·1
8.00 “	11·3	1·1	0·3	11·5	2·1	11·1	62·6	25·0
9.15 “	10·7	1·3	0·4	11·7	3·8	13·0	59·1	28·9
10.10 “	11·4	1·1	0·5	11·1	2·7	12·4	60·8	26·7
11.10 “	13·0	1·1	0·0	10·2	2·5	10·3	62·9	23·0
12.10 a.m.	10·7	1·3	0·3	8·8	2·9	8·3	67·7	20·3
1.10 “	7·6	1·1	0·1	20·0	2·1	4·7	64·4	26·9
2.10 “	10·5	1·1	0·2	11·4	2·9	10·6	63·3	25·1
3.10 “	11·2	1·3	0·1	9·7	3·0	8·3	66·4	21·1
4.10 “	9·2	1·0	0·2	12·1	2·8	12·1	62·6	27·2
5.10 “	10·9	0·9	0·1	12·3	2·4	7·9	65·5	22·7
6.10 “	10·3	1·1	0·1	13·4	2·0	13·6	59·5	29·1
7.10 “	11·6	1·0	0·2	12·6	1·9	11·9	60·8	26·6
8.10 “	11·0	1·0	0·2	12·9	2·0	14·1	58·8	29·2

OBSERVATIONS OF GAS METER AND B.H.P.

Date—February 8 and 9, 1909

Trial Number—25.

Notes: B.O. indicates that there is a surplus supply of gas blowing off to atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
8.40 a.m.	1893340	......	N.B.O.	......	275	95	180	19730
9.10 "	1895000	1660	"	8.55 a.m.	300	115	185	......
9.40 "	1896680	1680	"	......	300	115	185	......
10.10 "	1898600	1920	"	......	300	120	180	......
10.40 "	1900470	1870	"	......	300	120	180	......
11.10 "	1902420	1950	"	......	300	120	180	......
11.40 "	1904330	1910	"	......	300	120	180	......
12.10 p.m.	1905900	1510	"	......	300	120	180	......
12.40 "	1907700	1800	"	......	300	120	180	......
1.10 "	1909500	1800	"	......	300	120	180	......
1.40 "	1911500	2000	"	......	300	120	180	......
2.10 "	1913520	2020	"	......	300	120	180	......
2.40 "	1915560	2040	"	......	300	110	190	......
3.10 "	1917800	2240	"	......	300	110	190	......
3.40 "	1919620	1820	"	......	300	120	180	66100
4.10 "	1921520	1900	"	......	300	115	185	......
4.40 "	1923200	1680	"	......	300	115	185	......
5.10 "	1925080	1880	"	......	300	115	185	......
5.40 "	1926950	1870	"	......	300	115	185	......
6.10 "	1928050	1800	"	......	300	115	185	......
6.40 "	1930860	2110	"	......	300	115	185	......
7.10 "	1932760	1900	B.O.	......	300	115	185	......
7.40 "	1934500	1840	"	......	300	115	185	......
8.10 "	1936260	1760	"	......	300	115	185	......
8.40 "	1938050	1790	"	......	300	115	185	......
9.10 "	1940090	2040	"	......	300	115	185	......
9.40 "	1941680	1590	"	......	300	115	185	......
10.10 "	1943630	1950	"	......	300	115	185	......
10.40 "	1945500	1870	"	......	300	115	185	......
11.10 "	1947230	1730	"	......	300	115	185	......
11.40 "	1948850	1620	N.B.O.	......	275	105	170	16770
12.10 a.m.	1951100	2250	"	......	275	105	170	......
12.40 "	1952400	1800	"	......	275	100	175	......
1.10 "	1954900	2000	"	......	275	100	175	......
1.40 "	1956700	1800	"	......	275	100	175	......
2.10 "	1958450	1750	"	......	275	95	180	32850
2.40 "	1960320	1870	"	......	275	95	180	......
3.10 "	1962000	1780	"	......	275	95	180	......
3.40 "	1963835	1835	"	......	275	85	180	......
4.10 "	1965800	1965	"	......	275	95	180	......
4.40 "	1967630	1830	"	......	275	95	180	......
5.10 "	1969430	1800	"	......	275	95	180	......
5.40 "	1971400	1970	"	......	275	95	180	......
6.10 "	1973465	2065	"	......	275	95	180	......
6.40 "	1975235	1770	"	......	275	95	180	......
7.10 "	1977140	1905	"	......	275	95	180	......
7.40 "	1978400	1860	"	......	275	95	180	......
8.10 "	1980780	1880	"	......	275	95	180	......
8.40 "	1982440	1660	"	......	275	95	180	74240

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—February 8 and 9, 1909.

Note: Boys Calorimeter used.

Trial Number—25.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent. Inlet	Water Temp. Deg. Cent. Outlet	Cubic Centimeters of Water.	B.T.U. per Cubic Foot.
8.40 a.m.	58	$\frac{5}{12}$	5·03	11·39	2025	122·3
9.10 “	58	$\frac{5}{12}$	4·23	10·30	1920	129
9.40 “	58	$\frac{1}{4}$	3·90	8·49	1630	118·6
10.10 “	59	$\frac{7}{12}$	3·96	14·06	1685	115·5
10.40 “	59	$\frac{1}{2}$	4·08	11·32	1800	103·3
11.10 “	59	$\frac{5}{12}$	3·97	10·54	1680	104·9
11.40 “	59	$\frac{7}{12}$	3·98	13·69	1810	119·3
12.10 p.m.	59	$\frac{1}{2}$	3·80	11·54	1810	110·8
12 40 “	59	$\frac{5}{12}$	4·07	10·79	1650	105·4
1.10 “	59	$\frac{5}{12}$	4·06	10·31	1770	105·1
1.40 “	59	$\frac{1}{3}$	4·42	9·79	1630	104·0
2.10 “	59	$\frac{1}{2}$	4 30	11·36	1870	104·2
2.40 “	58	$\frac{5}{12}$	4·13	10·20	1755	101·1
3.10 “	57	$\frac{5}{12}$	4·25	10·92	1730	109·5
3.40 “	58	$\frac{5}{12}$	3·85	10·14	1910	113·6
4.10 “	57	$\frac{1}{3}$	3·94	9·17	1900	118·2
4.40 “	57	$\frac{1}{3}$	3·97	8·59	1845	101·3
5.10 “	57	$\frac{1}{4}$	4·42	8·27	1609	99·6
5.40 “		$\frac{1}{4}$	4·14	8·25	1840	119·8
6.10 “						
6 40 “	57	$\frac{1}{3}$	4·37	9·76	1600	102·3
7.10 “	57	$\frac{1}{3}$	5·51	12·03	1600	123·8
7.40 “	57	$\frac{1}{3}$	4·42	9·75	1750	111·0
8.10 “	58	$\frac{1}{3}$	4·34	9·37	1760	105·3
8.40 “	58	$\frac{5}{12}$	4·23	10·94	1625	103·6
9.10 “	58	$\frac{5}{12}$	4·52	10·62	1720	99·5
9.40 “	58	$\frac{5}{12}$	4·58	10·43	1820	101·1
10.10 “	58	$\frac{5}{12}$	4·59	11·29	1770	112·6
10.40 “	58	$\frac{5}{12}$	4·50	10·26	1870	102·3
11.10 “	58	$\frac{5}{12}$	4·73	9·83	1910	92·5
11.40 “	58	$\frac{5}{12}$	4·81	9·06	1825	90·0
12.10 a.m.						
12.40 “	58	$\frac{7}{12}$	4·67	12·58	1680	90·0
1.10 “	58	$\frac{7}{12}$	4·73	13·04	1680	94·8
1.40 “	58	$\frac{7}{12}$	5·08	13·43	1815	102·8
2.10 “	57	$\frac{1}{2}$	4·78	11·24	1665	85·2
2.40 “	57	$\frac{1}{2}$	4·77	13·27	1775	119·2
3.10 “	57	$\frac{5}{12}$	4·79	10·12	1840	93·3
3.40 “	57	$\frac{1}{3}$	4·22	9·00	1835	104·3
4.10 “	57	$\frac{5}{12}$	4·30	10·21	1800	101·0
4.40 “	56	$\frac{5}{12}$	4·22	10·05	1860	103
5.10 “	56	$\frac{1}{3}$	4·26	9·42	1600	98·0
5.40 “	56	$\frac{1}{3}$	4·70	10·57	1650	115·0
6.10 “	57	$\frac{1}{3}$	4·69	9·83	1895	115·6
6.40 “	57	$\frac{5}{12}$	4·59	12·02	1700	120·0
7.10 “	57	$\frac{5}{12}$	4·54	10·46	1950	109·6
7.40 “	57	$\frac{5}{12}$	4·39	10·31	1710	96·3
8.10 “	57	$\frac{5}{12}$	4·44	11·76	1735	120·4

Time	Coal Charged. lbs.	Total Coal. lbs.	Time of Poking.
8.40 a.m.			
10.05 “	75	75	
10.45 “	25	100	
11.25 “	50	150	
12.05 p.m.	50	200	
12.25 “	50	250	12.20 p.m.
2.05 “	50	300	12.35 “
2.55 “	50	350	
3.45 “	75	425	
5.20 “	50	475	3.30 “
6.15 “	50	525	
7.00 “	50	575	
7.40 “	50	625	
8.25 “	50	675	
9.30 “	50	725	9.15 “
10.00 “	50	775	
10.55 “	50	825	9.55 “
11.45 “	25	850	
1.30 a.m.	50	900	
2.15 “	50	950	
2.40 “	50	1000	2.35 a.m.
3.20 “	50	1050	
4.10 “	50	1100	
4 40 “	50	[illegible]	
5.30 “	25		
6.00 “	50	1225	
6.35 “	50	1275	
7.30 “	25	1300	
8.00 “	50	1350	
8.40 “			

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—February 8 and 9, 1909. **Trial Number—25.**

Time.	Temperatures. °F.				Pressure. Ins. of Water.			Suction. Ins. of Water.			Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.40 a.m.	760	62	59	75	3·6	6·0	6·2	7·0	3·3	0·7	69	65
9.10 "	770	62	60	172	3·6	6·0	6·2	8·2	3·5	0·9	72	68
9.40 "	780	62	60	148	3·7	6·4	6·6	7·6	3·6	1·2	70	67
10.10 "	810	62	61	153	3·7	6·5	6·7	7·7	3·4	0·9	65	61
10.40 "	800	62	61	160	3·7	6·0	6·2	9·3	4·3	1·7	66	63
11.10 "	800	62	62	136	3·7	6·5	6·7	9·3	4·0	1·5	66	64
11.40 "	840	62	60	131	3·6	6·2	6·3	9·3	4·0	1·8	65	62
12.10 p.m.	780	62	59	130	3·6	6·1	6·3	8·4	4·0	1·4	69	66
12.40 "	820	63	60	132	3·6	6·6	6·8	8·8	3·7	1·4	60	57
1.10 "	820	61	60	130	3·8	6·6	6·8	9·3	3·5	1·4	61	57
1.40 "	820	61	60	130	3·8	6·6	6·8	9·3	3·5	1·4	59	55
2.10 "	840	60	58	135	3·8	7·0	7·2	9·8	3·6	1·5	68	65
2.40 "	840	61	57	139	3·8	7·0	7·2	10·0	3·7	1·8	60	55
3.10 "	830	60	57	140	3·7	7·0	7·2	8·0	3·5	1·6	53	50
3.40 "	870	62	56	140	3·8	6·8	7·0	9·0	3·6	1·5	54	50
4.10 "	840	63	56	138	3·7	6·8	7·0	7·0	3·5	1·5	60	56
4.40 "	830	62	56	136	3·7	6·7	6·9	8·3	4·0	1·9	52	48
5.10 "	820	62	57	137	3·7	6·7	6·9	8·7	4·0	2·0	55	51
5.40 "	840	61	58	143	3·7	6·6	6·8	8·7	3·9	1·8	50	47
6.10 "	830	61	58	141	3·7	6·6	6·8	8·6	3·8	1·7	52	49
6.40 "	830	60	58	141	3·8	6·5	6·7	9·7	4·3	2·0	38	35
7.10 "	830	62	58	139	3·7	6·6	6·8	9·7	4·4	2·3	43	40
7.40 "	830	64	58	137	3·6	6·7	6·9	9·8	4·4	2·4	47	44
8.10 "	850	62	57	136	3·7	7·0	7·2	9·0	4·5	2·4	46	43
8.40 "	860	61	57	135	3·7	6·8	7·0	8·8	4·6	2·2	60	56
9.10 "	870	61	58	128	3·8	6·9	7·4	9·0	4·7	2·1	70	67
9.40 "	880	61	57	128	3·8	7·0	7·2	8·8	4·3	2·0	73	70
10.10 "	900	61	58	132	3·8	7·3	7·5	9·3	4·0	1·7	61	58
10.40 "	860	60	58	135	3·7	6·5	6·6	7·7	3·8	1·5	49	48
11.10 "	870	61	58	130	3·7	6·5	6·7	8·9	4·0	1·6	60	56
11.40 "	870	61	58	126	3·7	6·4	6·6	8·8	4·0	1·7	76	73
12.10 a.m.	900	61	58	125	3·7	7·5	7·7	10·0	4·5	2·1	70	67
12.40 "	890	60	57	128	3·8	7·4	7·6	11·0	5·3	2·7	58	55
1.10 "	860	59	57	130	4·0	7·8	8·0	9·7	3·6	1·3	43	40
1.40 "	860	61	57	127	3·8	7·8	8·0	8·2	3·6	1·3	55	52
2.10 "	850	65	58	124	3·6	7·8	8·0	8·3	3·5	1·2	65	62
2.40 "	850	62	58	124	3·6	7·6	7·8	9·0	4·0	2·0	65	63
3.10 "	860	61	57	125	3·7	7·8	8·0	9·7	4·5	2·4	63	60
3.40 "	860	60	57	120	3·7	7·7	7·9	8·8	3·6	1·7	63	67
4.10 "	870	58	56	128	3·7	6·7	7·8	9·4	4·2	2·1	57	54
4.40 "	870	58	56	123	3·8	6·7	9·8	10·4	4·5	2·3	66	63
5.10 "	880	58	57	130	3·7	6·6	6·8	10·0	4·0	2·1	60	57
5.40 "	880	61	58	130	3·7	6·7	6·9	9 8	4·1	1·9	50	47
6.10 "	880	63	60	129	3·9	7·0	7·2	10·5	4·5	2·0	54	50
6.40 "	900	63	60	126	3·6	6·6	6·8	9·4	4·0	1·6	65	62
7.10 "	900	62	60	138	3·8	6·9	7·1	9·8	4·4	2·0	75	72
7.40 "	880	61	58	124	3·7	6·7	6·9	9·4	4·0	1·8	78	75
8.10 "	900	60	56	34	3·7	6·6	6·8	9·8	4·0	1·5	75	72
8.40 "	870	60	57	130	3·7	5·5	5·7	7·5	3·5	1·2	70	67

PRODUCER TRIAL No. 25.

Date—February 8-9, 1909. Producer No. 4, at McGill University.

Time of lighting up—4.00 a.m. Trial commenced 8.40 a.m., February 8; ended 8.40 a.m., February 9.

Duration of trial—24 hours. Kind of fuel—No. 22 M coal.

Observers and staff during trial—Cameron, Killam, Gardner

Computers—Cameron, Killam.

Chemists—Campbell, Nicolls, Stansfield.

SUMMARY OF OBSERVATIONS.

	Fuel.		
1.	Total coal charged during trial	lbs.	1350
2.	Moisture in coal as charged	per cent.	4·2
3.	Calorific value of coal as charged, per lb.	B.T.U.	11220
4.	" " of dry coal per lb.	B.T.U.	11720
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 46·9, volatile matter, 36·9; ash, 12·0; moisture, 4·2	per cent	
6.	Combustible in dry refuse removed during trial: fixed carbon, 48·6; volatile matter, 2·8. Total	per cent.	51·4
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	42·8
	Gas.		
8.	Total gas produced during trial (from meter readings)	cub. ft.	89,150
9.	Average temperature of gas leaving producer	°F.	848
10.	" " " at meter	°F.	61·2
11.	Average temperature of air in producer house	°F.	55·0
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U	106·8
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	107·9
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	99·3
14.	Average barometric pressure	lbs. sq. in.	14·66
15.	" suction at producer	ins. of water	1·73
16.	" suction at exhauster	ins. of water	9·03
17.	" pressure of gas at meter	ins. of water	5·15
	Steam, Water, Etc.		
18.	Total steam used in producer during trial	lbs.	2040
19.	" water used in scrubber and gas washer	lbs.	38090
20.	" tar extracted in scrubber and gas washer	lbs.	30
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5
	Engine.		
23.	Total revolutions during trial (from counter)		309020
24.	Average explosions per minute		102·3
25.	Average effective load on brake	lbs.	181·5
26.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq. in.	68·9
28.			

Notes.

Fire poked at: 12.20, 12.35, 3.30, 9.15, 9.55 p.m.; 2.35 a.m.

Refuse removed at: 9.50, 10.45 a.m.; 12.20, 2.45, 5.15, 7.40, 9.55 p.m.; 12.50, 2.20, 2.35, 3.15, 4.40, 6.00, 7.40, 8.10 a.m.

Behaviour of coal: Very little attention needed

Average time between poking: 4 hours.

Clinker: No special difficulties recorded.

Tar: Small amount removed from wet scrubber

State of engine valves at end of trial: Clean

Valves last cleaned: Jan. 29, 1909

29. **Analysis of Dry Coal.**

Hydrogen	4·9%
Carbon	66·1%
Nitrogen	1·4%
Oxygen	12·6%
Sulphur	0·9%
Total carbon contained by dry coal charged	855·0 lbs.

30. **Analysis of Gas by Volume.**

Carbon dioxide	10·8%
Oxygen	1·2%
Carbon monoxide	11·7%
Hydrogen	10·7%
Methane	2·8%
Ethylene	0·2%
Nitrogen	62·6%

REMARKS.

This seems to be a good coal for producer work. By comparing this trial with No. 18, on the same coal, the effect of poking the fire and forcing the coal, though only partly consumed, is clearly seen.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

31.	Dry coal charged during trial	lbs.	1292
32.	Combustible charged during trial	lbs.	1130
33.	Average B.H.P. of engine during trial	H.P.	28·44
34.	" indicated H.P of engine during trial	H.P.	40·30
35.	" H.P. taken by exhauster and gas washer	H.P.	4·0
36.	" B.H.P. while gas consumption of engine was taken	H.P.	28·44
37.	" " corresponding to total gas produced	H.P.	28·44
38.	" " " " " " and available for outside use, allowing for power used	H.P.	24·44

HOURLY QUANTITIES.

39.	Coal charged per hour	lbs.	56·2
40.	Dry coal charged per hour	lbs.	53·8
41.	Combustible charged per hour	lbs.	47·1
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	14·0
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	13·4
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	11·8
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	7·92
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	12·63
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3715
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft.	3676
49.	Gas (by meter) supplied to engine per hour while gas consumption was taken	cub. ft.	3715
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	3676
	Calorific value of coal charged per hour	B.T.U.	630000
52.	" " gas produced per hour (lower value)	B.T.U.	364900
53.	Steam used in producer per hour	lbs.	85·0

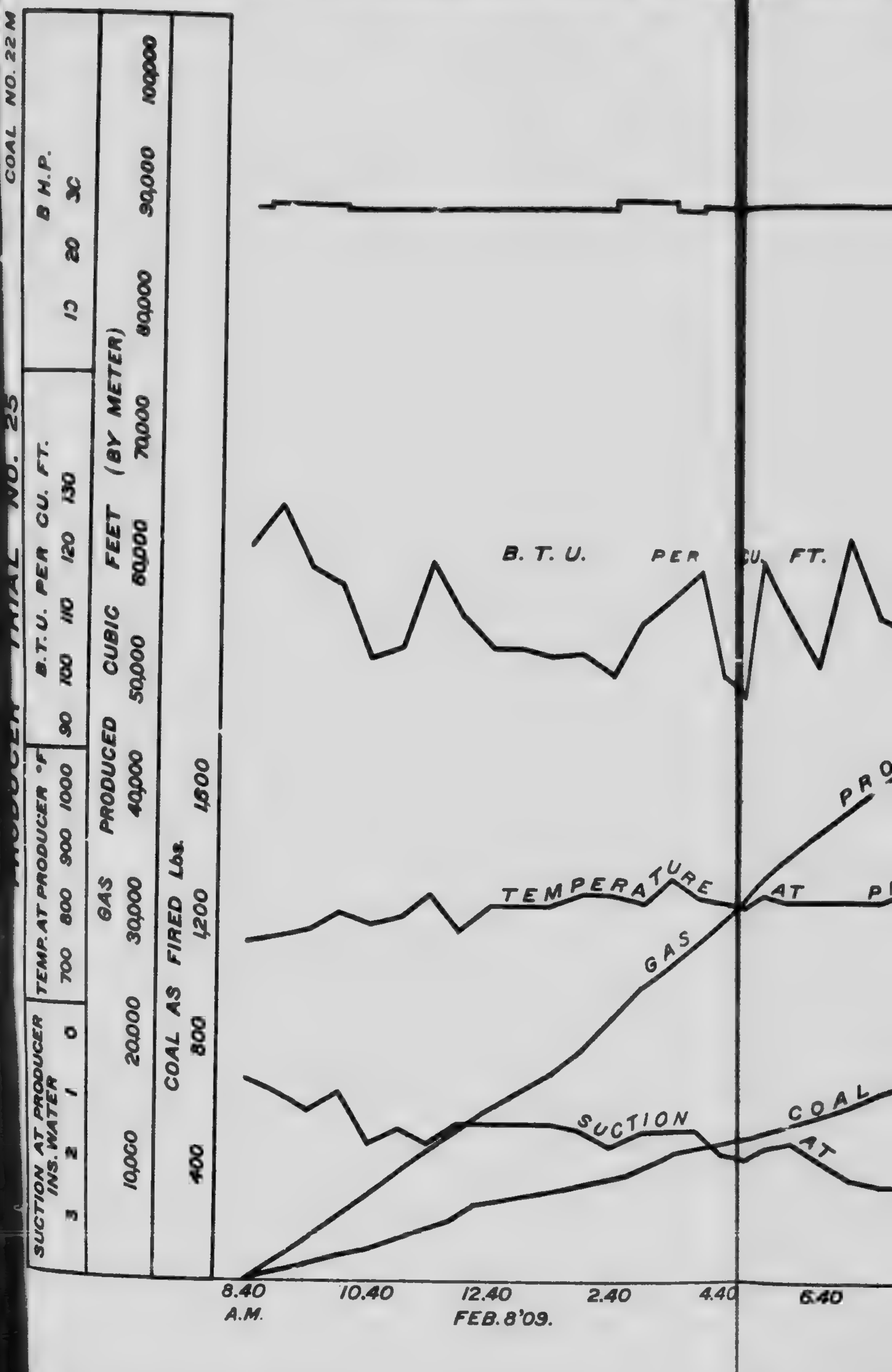
ECONOMIC RESULTS.

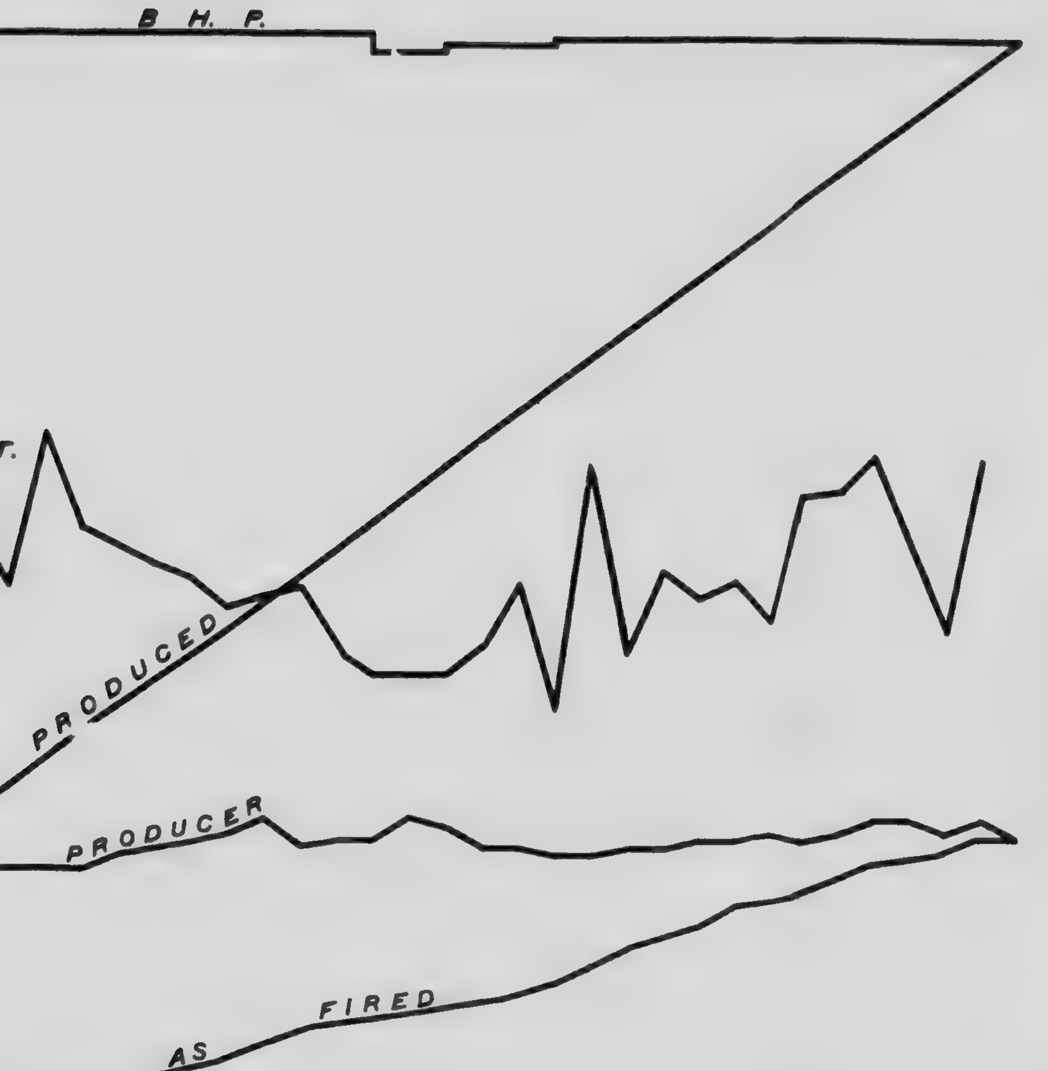
54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	65·5
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	68·3
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged	cub. ft.	78·0
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per 1 H.P. per hr.	cub. ft.	91·2
58.	" " " " " " B.H.P. "	cub. ft.	129·0
59.	Steam used in producer per lb. coal charged	lbs.	1·51
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	28·2
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced	lbs.	427·0
62.	Efficiency of process of gas production and cleaning, based on coal charged	per cent.	58·2
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	50·2
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer	per cent.	41·0
65.	Thermal efficiency of engine, based on B.H.P	per cent.	19·7
66.	Over all efficiency of producer and engine plant	per cent.	11·46
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12910
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	22200

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine	1·98	1·89	1·66
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·30	2·20	1·93
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer	2·81	2·70	2·36

PRODUCER TRIAL NO. 25

COAL NO. 22 M


COAL NO. 22 M
PRODUCER TRIAL NO. 25
B.H.P.
10 20 30
B.T.U. PER CU. FT.
90 100 110 120 130
TEMP. AT PRODUCER °F
700 800 900 1000
SUCTION AT PRODUCER INS. WATER
3 2 1 0
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000
COAL AS FIRED Lbs.
400 800 1200 1600
B. T. U. PER CU. FT.
TEMPERATURE AT PR
GAS PRO
SUCTION AT
COAL
8.40 A.M.
10.40
12.40
2.40
4.40
6.40
FEB. 8 '09.



APPENDIX III VOL.V

NANAIMO COMOX COAL FIELD

VANCOUVER ISLAND, B.C.

TRIAL OF No. 4 PRODUCER WITH COAL No. 18

Date—January 14 and 15, 1909.

Trial Number—20.

OBSERVATIONS OF GENERAL CONDITIONS.

General Notes.

Barometer at beginning of trial	30 22 inches
" " 8.50 p.m., Jan. 14	29 74 "
" " end of trial	29 82 "
Water meter at 11.05 a.m., Jan 14	57,770 imperial gallons
" " " 8.05 a.m., Jan. 15	60,460 " "
Difference, in 21 hours	2,690 " "
Brick in producer base	1,065 lbs.
Average level of coal below the top plate of the producer	20 inches

TIME.				
5.00	a.m.,	Jan.	14	Fire started with 10 lbs. of shavings, 46 lbs of wood, 140 lbs. of coke.
7 30	"	"	"	Charged 224 lbs. of coal.
8.00	"	"	"	Down-draft with fan exhausting directly to the atmosphere.
8.30	"	"	"	Down-draft with blower.
8.30	"	"	"	Charged 64 lbs. of coal.
8 30	"	"	"	Started the engine.
8.40	"	"	"	Charged 64 lbs. of coal.
8 45	"	"	"	" 50 " "
8.50	"	"	"	Trial commenced.
1.00	p.m.,	"	"	Steam blown through gas-washer.
4.40	"	"	"	" " "
10 15	"	"	"	" " "
10 30		"	"	" " "
8.50	a.m.,	"	15	Trial finished.

The engine valves were found to be covered with tar at the end of the trial. 41 lbs of tar removed from the wet scrubber, and 4 lbs. of tar removed from the gas washer discs.

Wet refuse removed from the producer during the trial	656 lbs
100 lbs of this when dried weighed	59 "
Wet refuse removed after the trial	1,345 "
100 lbs of this when dried weighed	57 "

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 14 and 15, 1909. **Serial Number—20.**

Note: R. and B. apparatus used.

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9.20 a.m....	11·0	1·5	0·4	11·8	3·8	9·7	61·8	25·7
10.00 "	8·7	2·0	0·5	10·2	4·2	11·3	63·1	26·2
11.15 "	11·6	0·5	0·3	10·8	4·4	12·8	59·6	28·3
12.20 p.m....	10·0	0·4	0·4	11·6	5·1	12·9	59·6	30·0
2.20 "	11·1	0·5	0·2	12·2	3·1	12·9	60·0	28·4
3.00 "	11·6	0·3	0·4	12·4	3·2	13·8	58·3	29·8
4.00 "	11·5	1·2	0·1	11·1	4·0	13·7	58·4	28·9
5.00 "	10·1	0·3	0·6	9·8	5·2	8·4	65·6	24·0
6.20 "	7·9	0·2	0·4	16·0	3·7	4·6	67·8	24·7
7.20 "	10·2	0·4	1·0	9·0	6·1	11·3	62·0	27·4
8.20 "	9·2	0·4	0·6	11·6	6·0	10·8	61·4	29·0
9.20 "	9·0	0·4	0·9	13·5	5·0	11·8	59·4	31·2
10·20 "	8·9	0·0	1·1	9·1	8·1	9·9	62·9	28·2
10.50 "	9·6	0·4	1·2	8·6	4·2	6·8	69·2	20·8
12.20 a.m....	10·9	1·8	0·7	11·2	3·1	14·5	57·8	29·5
1.20 "	12·9	0·9	0·1	11·9	3·4	16·5	54·3	31·9
2.20 "	11·1	0·3	0·2	16·4	2·5	13·6	55·9	32·7
3.10 " ...	12·4	0·2	0·1	13·0	3·4	15·5	55·4	32·0
3.20 " ...	12·4	0·5	0·2	11·6	3·9	15·2	56·2	30·9

OBSERVATIONS OF GAS METER AND B.H.P.

Date—January 14 and 15, 1909.

Trial Number—20.

Notes; B.O. indicates that there is a surplus supply of gas blowing off into atmosphere. N.B.O. indicates that all the gas is passing to gas engine.

Time.	Main gas meter readings.	Cubic feet in interval.	Remarks.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.			lbs.	lbs.	lbs	
8.50 a.m. ..	1475055						
9.20 " ..	1476430	1375	N.B.O.	32	125	200	53251
9.50 " ..	1478120	1690	"	325	125	200	
10.20 " ..	1479810	1690	"	300	112	188	59695
10.50 " ..	1481255	1445	"	300	112	188	
11.20 " ..	1482760	1505	"	300	112	188	
11.50 " ..	1484230	1470	"	300	112	188	
12.20 p.m. ..	1485810	1580	"	300	112	188	
12.50 " ..	1487260	1450	"	300	112	188	
1.20 " ..	1488785	1525	"	300	112	188	
1.50 " ..	1490415	1630	"	300	112	188	
2.20 " ..	1492030	1615	"	300	112	188	
2.50 " ..	1493570	1540	"	300	112	188	
3.20 " ..	1495170	1600	"	300	112	188	
3.50 " ..	1496700	1530	"	300	112	188	
4.20 " ..	1498035	1335	"	300	112	188	
4.50 " ..	1499520	1495	"	300	112	188	
5.20 " ..	1501110	1590	"	300	112	188	
5.20 " ..	1502685	1575	"	300	112	188	
6.20 " ..	1504130	1445	"	300	112	188	
6.50 " ..	1505615	1485	"	300	112	188	
7 20 " ..	1506935	1320	"	300	112	188	
7.50 " ..	1508190	1255	"	275	100	175	
8 20 " ..	1509460	1270	"	275	100	175	
8 50 " ..	1510750	1290	"	275	105	170	31735
9 20 " ..	1512030	1280	"	275	105	170	
9 50 " ..	1513350	1320	"	275	105	170	
10 20 " ..	1514795	1445	"	275	105	170	
10'50 " ..	1516040	1245	"	250	93	157	
11.20 " ..	1517545	1505	"	250	93	157	
11.50 " ..	1519100	1555	"	275	103	172	
12 20 a.m. ..	1520725	1625	"	275	103	172	
12 50 " ..	1522115	1390	"	275	103	172	
1 20 " ..	1523660	1545	"	300	112	188	61649
1 50 " ..	1525230	1570	"	300	112	188	
2.20 ..	1526855	1625	B.O.	325	125	200	
2.50 " ..	1528490	1635	N.B.O.	325	125	200	
3 20 " ..	1530110	1620	"	325	125	200	
3 50 " ..	1531735	1625	"	325	125	200	
4 20 " ..	1533320	1585	"	325	125	200	
4 50 " ..	1534880	1560	"	325	125	200	
5 20 " ..	1536290	1460	"	325	125	200	
5 50 " ..	1537775	1485	"	325	125	200	91660
6 20 " ..	1539380	1605	"	325	125	200	
6 50 " ..	1541060	1680	"	325	125	200	
7 20 " ..	1542730	1670	"	325	125	200	
7 50 " ..	1544385	1655	"	300	110	190	
8 20 " ..	1546080	1695	"	300	110	190	
8 50 " ..	1547850	1770	"	300	110	190	10721

OBSERVATIONS OF GAS CALORIMETER AND COAL WEIGHED.

Date—January 14 and 15, 1909. Trial Number—20.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet				lbs.	lbs.	
8.50 a.m.	46	$\frac{5}{12}$	7·75	16·49	1610	133·7				
9·20 "	48	$\frac{1}{3}$	5·39	12·39	1627	135·3				
9.50 "	49	$\frac{1}{3}$	5·83	12·26	1620	124·0				
10 20 "	51	$\frac{1}{3}$	6·56	13·45	1650	129·0	10. 10 a.m.	25	25	10 00 a.m.
10.50 "	52	$\frac{1}{3}$	7·33	13·97	1725	135·1	...			10 15 "
11.20 "	52	$\frac{1}{3}$	6·16	12·72	1800	140·2	10 35 "	25	50	10.55 "
11.50 "	52	$\frac{7}{12}$	6·25	18·33	1665	136·7	10.55 "	50	100	
12.20 p.m.	53	$\frac{1}{2}$	5·90	16·83	1590	137·7	11.20 "	50	150	11.20 "
12.50 "	53	$\frac{5}{12}$	5·95	15·20	1600	141·3	12.20 p.m.	25	175	12.15 p.m.
1.20 "	54	$\frac{1}{2}$	6·49	17·28	1720	147·0	12.45 "	50	225	......
1.50 "	54	$\frac{5}{12}$	4·83	14·16	1600	142·0	1.15 "	25	250	1 00 "
2.20 "	54	$\frac{5}{12}$	4·74	12·69	1700	128·4	1.45 "	50	300	1.45 "
2.50 "	54	$\frac{5}{12}$	4·20	12·71	1680	128·0	2.35 "	50	350	2.15 "
3.20 "	55	$\frac{5}{12}$	4·74	12·00	1675	115·7			...	2 35 "
3.50 "	55	$\frac{1}{2}$	5·43	14·91	1840	138·3	3·45 "	50	400	3 30 "
4.20 "	59	$\frac{5}{12}$	5·64	13·76	1780	137·5	4 05 "	50	450	4.05 "
4.50 "	59	$\frac{5}{12}$	6·79	13·84	1770	127·0	4.45 "	50	500	4 35 "
5.20 "	61	$\frac{5}{12}$	5·60	12·95	1930	135·0	5.17 "	50	550	5 10 "
5.50 "	62	$\frac{5}{12}$	5·60	11·95	1850	111·7	5 55 "	50	600	
6.20 "	62	$\frac{5}{12}$	5·76	12·52	1715	116·0	6 35 "	75	675	6 30 "
6.50 "	63	$\frac{5}{12}$	6·07	15·51	1710	153·4				
7.20 "	64	$\frac{5}{12}$	6·22	15·82	1660	151·5				
7.50 "	64	$\frac{5}{12}$	6·38	15·40	1605	137·5	7.45 "	50	725	
8.20 "	65	$\frac{5}{12}$	6·52	14·29	1600	118·3	8 15 "	75	800	8 10 "
8.50 "	64	$\frac{1}{2}$	6·52	17·05	1850	154·3	8.45 "	25	825	8·45 "
9 20 "	64	$\frac{1}{2}$	6·71	15·57	1835	128·2	9.20 "	50	875	9 15 "
9.50 "	65	$\frac{1}{2}$	6·77	15·98	1830	133·3	9.50 "	50	925	9 50 "
10.20 "	65	$\frac{1}{2}$	6·82	17·96	1820	160·7				
10.50 "	65	$\frac{1}{2}$	6·90	15·40	1790	120·5				
11.20 "	65	$\frac{1}{2}$	7·16	16·26	1680	147·0	11 05 "	50	975	11 00 "
11.50 "	67	$\frac{1}{2}$	7·25	17·37	1625	130·1	11.30 "	25	1000	11 30
12 20 a.m.	67	$\frac{1}{2}$	7·41	17·64	1600	129·8	11 50 "	50	1050	11 50
12.50 "	67	$\frac{1}{2}$	7·38	16·64	1600	117·5	12 45 a.m.	75	1125	
1.20 "	67	$\frac{7}{12}$	7·71	18·14	1775	125·8				12 15 a.m.
1 50 "	68	$\frac{7}{12}$	7·59	17·31	1785	117·9				
2 20 "	68	$\frac{5}{12}$	7·31	16·46	1590	145·9				
2.50 "	68	$\frac{1}{2}$	7·53	17·02	1600	120·0				
3 20 "	68	$\frac{7}{12}$	7·57	17·00	1770	113·4	3.15 "	75	1200	3 15
3 50 "	68	$\frac{7}{12}$	7·50	17·76	1760	121·5	3·30 "	50	1250	
4 20 "	68	$\frac{1}{2}$	7·76	17·19	1590	115·8				
4.50 "	68	$\frac{7}{12}$	7·75	18·31	1770	127·0				4 25
5.20 "	68	$\frac{1}{2}$	7·58	19·03	1600	144·2	5·25 "	50	1300	5 15
5.50 "	68	$\frac{1}{2}$	7·60	17·45	1600	125·0				
6 20 "	68	$\frac{7}{12}$	7·60	16·95	1770	112·5				
7 20 "	68	$\frac{1}{2}$	7·59	16·80	1600	116·8				
7.50 "	68	$\frac{1}{2}$	7·72	16·20	1600	107·6	8 00 "	25	1325	
8.20 "	68	$\frac{1}{2}$	7·46	18·67	1600	142·2	8 10 "	25	1350	8 15

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—January 14 and 15, 1909. Trial Number—20.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure. lbs. per sq. in.	
					Meter.		Exhauster.					
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
8.50 a.m.	570	50	50	122	3·5	5·0	5·2	6·7	5·8	1·1	69	67
9.20 “	610	52	54	151	3·8	6·3	6·5	7·2	6·3	1·5	64	61
9.50 “	620	54	57	144	3·8	6·3	6·5	7·3	6·5	1·6	71	68
10 20 “	620	56	58	143	3·5	5·4	5·6	6·8	5·8	2·0	66	64
10 50 “	620	58	62	139	3·5	5·6	5·8	8·2	7·4	2·2	64	61
11.20 “	640	60	57	140	3·5	6·1	6·3	7·2	6·4	2·3	58	54
11.50 “	660	60	56	137	3·6	5·9	6·1	8·3	7·5	2·4	62	58
12.20 p.m.	640	59	56	135	3·5	5·6	5·8	8·2	7·4	2·6	55	52
12.50 “	620	59	56	137	3·5	5·5	5·7	8·6	7·7	3·0	44	40
1 20 “	640	60	57	136	3·6	6·0	6·2	8·9	8·1	3·0	48	45
1 50 “	620	62	57	136	3·6	6·0	6·2	8·6	7·9	2·8	66	63
2 20 “	640	62	58	142	3·5	6·0	6·2	8·4	7·6	2·5	70	67
2 50 “	640	62	58	142	3·6	6·0	6·2	8·2	7·3	2·6	66	62
3 20 “	620	62	59	138	3·6	6·1	6·3	8·5	7·5	2·9	65	52
3 50 “	610	63	62	145	3·5	5·6	5·8	7·4	7·0	2·6	72	69
4 20 “	550	64	65	142	3·3	5·2	5·4	7·7	7·0	2·7	69	66
4 50 “	540	66	67	150	3·2	4·9	5·1	9·0	8·6	2·7	69	67
5.20 “	560	70	68	145	3·7	6·3	6·5	9·4	8·5	3·1	66	63
5 50 “	520	72	69	142	3·6	6·1	6·3	8·5	8·0	2·7	52	50
6 20 “	550	72	70	143	3·4	5·2	5·4	8·0	7·4	3·3	47	44
6 50 “	540	72	67	140	3·3	5·0	5·2	8·0	8·0	3·7	52	50
7 20 “	530	72	67	143	3·3	4·9	5·1	8·2	7·4	3·4	51	48
7 50 “	500	72	66	133	3·3	4·9	5·1	7·7	7·4	3·0	51	49
8 20 “	620	72	67	128	3·3	5·0	5·2	8·0	7·2	2·5	58	55
8 50 “	620	72	67	135	3·1	4·7	4·9	8·6	7·5	3·4	52	50
9 20 “	600	72	66	133	3·3	5·0	5·2	8·1	7·3	2·9	43	40
9 50 “	600	72	67	132	3·3	5·2	5·4	8·9	8·0	3·0	37	36
10.20 “	600	73	68	133	3·2	4·0	4·2	7·8	7·7	3·5	37	35
10 50 “	600	98	68	132	3·3	5·0	5·2	8·7	7·7	4·3	37	35
11 20 “	630	89	69	128	3·4	4·6	4·8	9·0	8·4	4·4	44	41
11 50 “	670	83	70	123	3·5	4·8	5·0	9·3	8·8	3·8	50	46
12 20 p.m.	660	79	70	137	3·5	4·2	4·4	8·1	8·0	3·6	40	37
12 50 “	650	77	70	135	3·3	4·2	4·4	7·3	6·9	3·2	48	43
1 20 “	680	76	72	140	3·4	4·8	5·0	8·9	8·3	3·8	48	42
1 50 “	680	74	70	138	3·5	4·9	5·1	9·1	8·5	3·8	40	36
2.20 “	680	74	70	133	3·7	5·3	5·5	8·6	8·1	2·8	31	27
2 50 “	620	73	70	127	3·6	5·0	5·2	8·2	7·7	2·8	26	18
3 20 “	700	72	69	134	3·7	5·4	5·6	9·1	8·1	3·3	39	33
3 50 “	700	72	70	138	3·6	4·8	5·2	8·0	7·7	3·1	45	33
4.20 “	700	72	70	131	3·6	5·2	5·4	8·3	7·8	3·1	37	33
4.50 “	690	72	70	136	3·4	4·2	4·4	7·1	7·0	2·8	29	25
5.20 “	690	72	70	135	3·3	4·4	4·6	7·3	6·8	3·0	28	23
5.50 “	710	72	70	137	3·5	5·5	5·7	8·9	8·0	2·9	38	30
6.20 “	710	72	69	135	3·5	4·7	4·9	8·3	7·5	2·9	35	32
6 50 “	700	72	70	134	3·4	4·6	4·8	8·1	7·4	2·9	37	34
7 20 “	710	72	70	133	3·5	4·7	4·9	8·2	7·4	2·8	42	38
7 50 “	720	71	63	138	3·5	4·8	5·0	8·3	7·7	2·8	44	41
8 20 “	760	71	68	142	3·8	5·7	5·9	9·4	8·7	3·1	52	49
8 50 “	760	71	70	140	3·8	5·9	6·1	9·4	8·9	3·2	72	70

PRODUCER TRIAL No. 20.

Date—January 14-15, 1909. Producer No. 4, at McGill University.
Time of lighting up—5.00 a.m. Trial commenced 8.50 a.m., January 14; ended 8.50 a.m., January 15.
Duration of trial—24 hours. Kind of fuel—No. 18.
Observers and staff during trial—Gardner, Killam, Cameron.
Computers—Cameron, Killam.
Chemists—Stansfield, Campbell, Nicolls.

SUMMARY OF OBSERVATIONS.

FUEL.

1.	Total coal charged during trial	lbs.	1350
2.	Moisture in coal as charged	per cent	1·5
3.	Calorific value of coal as charged, per lb	B.T.U.	12640
4.	" " of dry coal per lb	B.T.U.	12830
5.	Proximate analysis of coal as charged (by weight): fixed carbon, 44·5; volatile matter, 40·3; ash, 13·7; moisture, 1·5	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon, 56·0; volatile matter, 7·0	per cent.	63·0
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	40

GAS.

8.	Total gas produced during trial (from meter readings)	cub. ft.	72795
9.	Average temperature of gas leaving producer	°F.	656
10.	" " " at meter	°F.	69
11.	Average temperature of air in producer house	°F.	65
12a.	Average higher calorific value of gas per cub. ft. by calorimeter (as observed)	B.T.U.	130·9
12b.	Average higher calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	135·4
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	124·5
14.	Average barometric pressure	lbs. sq. in.	14·66
15.	" suction at producer	ins. of water	2·72
16.	" suction at exhauster	ins. of water	8·5
17.	" pressure of gas at meter	ins. of water	4·33

STEAM, WATER, ETC.

18.	Total steam used in producer during trial	lbs.	2350
19.	" water used in scrubber and gas washer	lbs.	36510
20.	" tar extracted in scrubber and gas washer	lbs.	48
21.	Average power required to drive exhauster	H.P.	2·5
22.	" " " gas washer	H.P.	1·5

ENGINE.

23.	Total revolutions during trial (from counter)		314940
24.	Average explosions per minute		100
25.	Average effective load on brake	lbs.	186·8
36.	Effective radius of brake wheel	ft.	3·836
27.	Average mean effective pressure from indicator diagrams	lbs. sq in.	67·83

28. **Notes.**

Fire poked at: 8.55, 10.00, 10.15, 10.55, 11.20 a.m.;12.15, 1.00, 1.45, 2.15., 2.35, 3.30, 4.05, 4[illegible], 5.10 6.30, 8.10 p.m.; 8.45, 9.15, 9.50, 11.00, 11.30, 11.50 p.m.;12.45, 3.15, 4.25, 5.15, 8.15 a.m.

Refuse removed at: 10.15 a.m.; 1.45, 2.25, 2.40, 4.55, 5.15, 6.35, 7.40, 8.10, 8.45, 9.15, 9.50, 10.05, 10.3[illegible], 11.00 p.m.; 12.45, 2.20, 3.15, 4.25, 5.15, 8.20, 8.50 a.m.

Behaviour of coal: Well fitted for producer work.
Average time between poking: 53 minutes.
Clinker: No special difficulties recorded.
Tar: Fair amount removed from wet scrubber and trouble was given by the tar.
State of engine valves at end of trial: Tarred up.
Valves last cleaned: Before trial.

29. ANALYSIS OF DRY COAL.

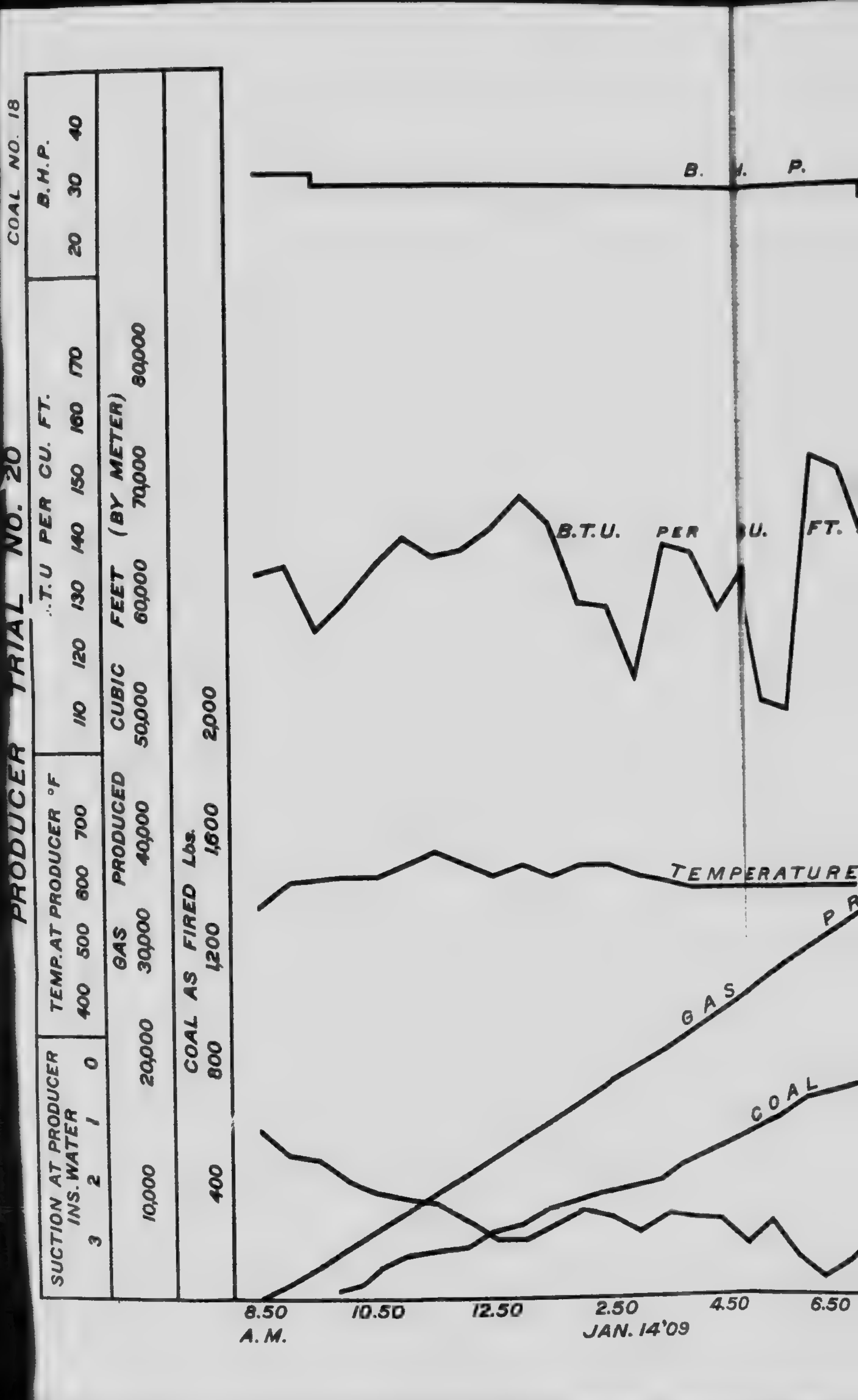
Hydrogen	4·8%
Carbon	72·1%
Nitrogen	1·2%
Oxygen	10·7%
Sulphur	0·9%
Total carbon contained by dry coal charged	960 lbs.

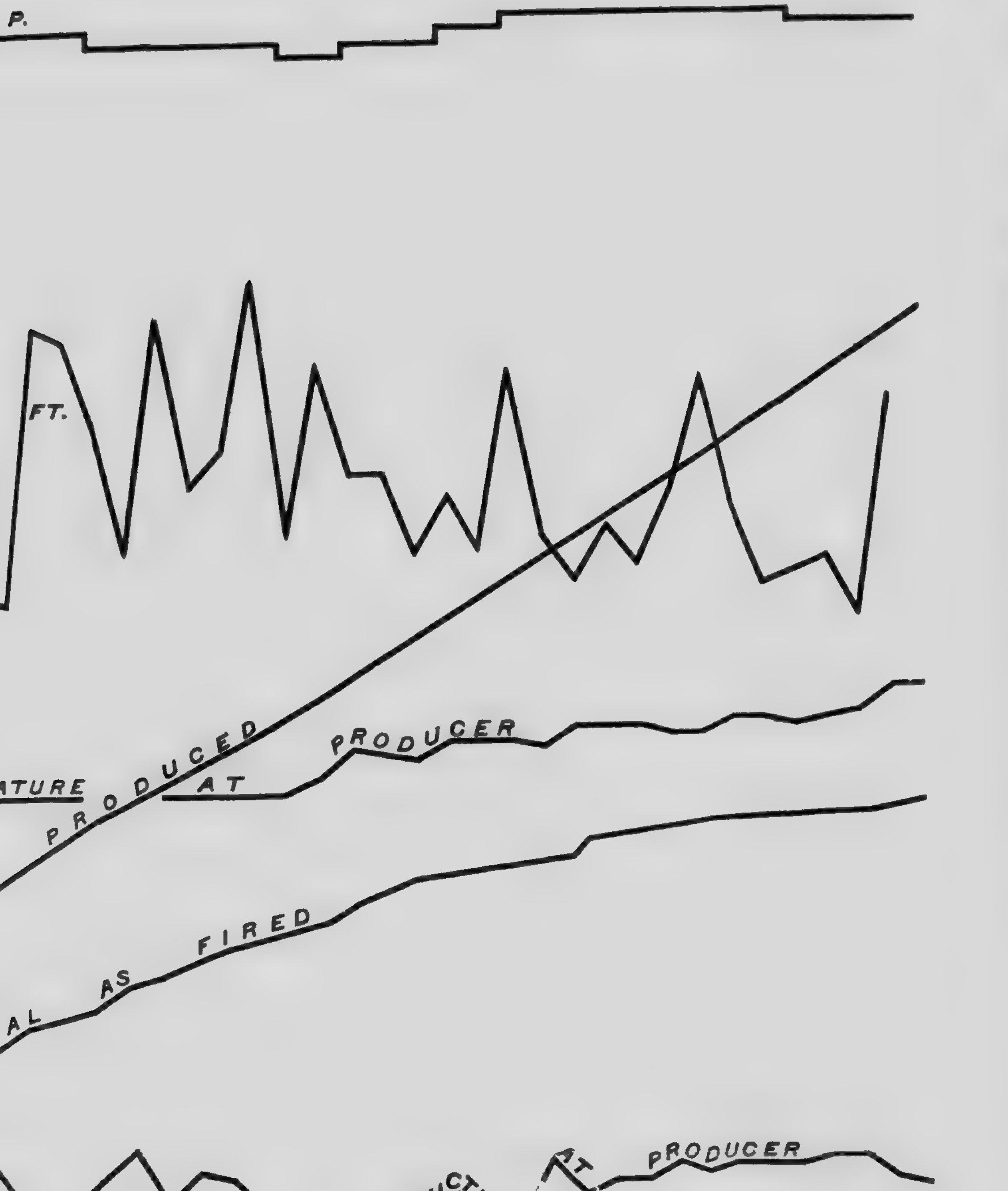
30. ANALYSIS OF GAS BY VOLUME

Carbon dioxide	10·5%
Oxygen	0·6%
Carbon monoxide	11·6%
Hydrogen	11·9%
Methane	4·3%
Ethylene	0·5%
Nitrogen	60·6%

PRODUCER TRIAL NO. 20

COAL NO. 18


PRODUCER TRIAL No. 20
COAL NO. 18
B.H.P.
20 30 40
B.T.U PER CU. FT.
110 120 130 140 150 160 170
TEMP. AT PRODUCER °F
400 500 600 700
SUCTION AT PRODUCER INS. WATER
3 2 1 0
GAS PRODUCED CUBIC FEET (BY METER)
10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000
COAL AS FIRED Lbs.
400 800 1,200 1,600 2,000
B. H. P.
B.T.U. PER CU. FT.
TEMPERATURE
P R
GAS
COAL
8.50 A.M.
10.50
12.50
2.50
4.50
6.50
JAN. 14'09



APPENDIX III VOL.V

Remarks.

This coal needed much attention, but gave fairly good economic results. Trouble was experienced from tar.

SUMMARY OF RESULTS.

Total Quantities.

31.	Dry coal charged during trial................	lbs.	1330
32	Combustible charged during trial............	lbs.	1146
33.	Average B.H.P. of engine during trial..	H.P.	29·84
34.	" indicated H.P. of engine during trial	H.P.	38·83
35.	" H.P. taken by exhauster and gas washer	H.P.	4·0
36.	" B.H.P. while gas consumption of engine was taken	H.P.	29·84
37.	" " corresponding to total gas produced	H.P.	29·84
38.	" " " " " " and available for outside use, allowing for power used.....	H.P.	25·84

Hourly Quantities.

39.	Coal charged per hour.	lbs.	56·2
40.	Dry coal charged per hour	lbs.	55·4
41.	Combustible charged per hour .	lbs.	47·8
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	14·0
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	13·8
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	11·9
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	7·52
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	12·9
47.	Gas (by meter) supplied by producer per hour	cub. ft.	3030
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per hour	cub. ft	2932
49	Gas (by meter) supplied to engine per hour while gas consumption was taken......	cub. ft.	3030
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per hour while gas consumption was taken	cub. ft.	2932
51.	Calorific value of coal charged per hour	B.T.U.	710000
52.	" " gas produced per hour (lower value	B.T.U.	365100
53.	Steam used in producer per hour	lbs.	98

Economic Results.

54.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of coal charged	cub. ft.	52·2
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft	52·9
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of combustible charged......................	cub. ft.	61·3
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I H.P. per hr.	cub. ft.	75·5
58.	" " " " " " B.H.P. "	cub. ft.	98·2
59.	Steam used in producer per lb. coal charged	lbs.	1·74
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	27·0
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas produced.....................	lbs.	502·5
62.	Efficiency of process of gas production and cleaning, based on coal charged..................	per cent.	51·5
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	44·6
64.	Efficiency of producer plant allowing for power used for auxiliaries and for steam used in producer..........	per cent.	36·3
65.	Thermal efficiency of engine, based on B.H.P	per cent.	20·8
66	Over all efficiency of producer and engine plant	per cent.	10·72
67.	Calorific value of gas supplied to engine per B.H.P per hour ..	B.T.U.	12220
68.	" " coal charged into producer per B.H.P. per hr...	B.T.U.	23760

		Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine........................	1·88	1·86	1·60
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries........................	2·18	2·14	1·85
71.	Pounds per hour charged into producer per B.H.P., allowing for power and also for steam used by producer....	2·67	2·63	2·27

TRIAL OF No. 4 PRODUCER WITH COAL No. 17.

Date—January 11 and 12, 1909. Trial Number—19

OBSERVATIONS OF GENERAL CONDITIONS

General Notes.

Barometer at beginning of trial.	29 65 inches
" " 9.30 p.m.	30 03 "
" " end of trial	30 15 "
Water meter at 9.45 a.m., Jan 11	53,381 imperial gallons
" " 7.00 a.m., Jan 12	56,428 " "
Difference, in 21¼ hours	3,047 " "
Brick in producer base	1,000 lbs
Average level of coal below top plate of producer	18 inches

Time.				
3.30	a.m.,	Jan.	11	Fire started with 10 lbs. of shavings, 50 lbs. of wood, 120 lbs. of coke
4.30	"	"	"	Charged 120 lbs. of coal.
5.30	"	"	"	Down-draft with fan exhausting directly to the atmosphere. Charged 100 lbs. of coal.
6.00	"	"	"	" 75 " "
6.45	"	"	"	" 75 " "
8.30	"	"	"	" 25 " "
8.35	"	"	"	Down-draft with blower.
8.50	"	"	"	Started engine
9.00	"	"	"	Charged 50 lbs. of coal.
9.00	"	"	"	Trial commenced.
9 30	p.m.,	"	"	Signs of tar on the engine valves.
1 30	a.m.,	"	"	Fire showed signs of caking.
3.15	"	"	12	Engine unable to carry any load, due to poor quality of gas.
3.30	"	"	"	
4.00	"	"	"	Owing to tar, the gas washer had to be replaced by the saw-dust scrubber.
5.45	"	"	"	The engine was stopped, due to deposits of tar upon the valves.
7 00	"	"	"	Trial finished.

Wet refuse removed from the producer during the trial	
100 lbs. of this when dried weighed	1,298 [illegible]
Wet refuse removed after the trial	58
100 lbs. of this when dried weighed	[illegible]

OBSERVATIONS OF COMPOSITION OF GAS BY VOLUME.

Date—January 11 and 12, 1909. Trial Number-

Note: R and B apparatus used

Time	Carbon Dioxide	Oxygen	Ethylene	Carbon monoxide	Methane	Hydrogen	Nitrogen	Inflammable gas
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
9 25 a.m	9·5	0·5	0·2	12·8	5·5	9·2	62·3	27·7
10 30 "	9·8	0·4	1·2	9·8	6·6	11·1	61·1	28·7
12 05 p.m	11·3	0·4	0·6	11·1	4·8	14·1	57·7	30·6
2 20	11·5	0·3	0·	[illegible]	3·7	14·4	56·4	31·8
3.00 "	11·9	0·3	0·1	[illegible]	3·1	13·5	58·5	29·3
4 15 "	13·8	0·3	0·1	10·7	2·1	18·4	54·6	31·3
5 00 "	13·7	0·3	0·2	9·6	3·5	15·4	57·3	28·7
6.00 "	9·1	0·1	0·1	13·9	3·2	11·8	61·8	29·0
7 00 "	10·1	0·4	0·6	8·9	6·2	17·6	56·2	33·3
8 00 "	11·0	0·4	0·	8·0	6·2	12·3	61·5	27·1
9 00 "	11·2	0·0	0·4	10·4	4·0	13·2	60·8	28·0
10 00 "	9·8	0·3	0·8	9·8	6·1	13·2	60·0	29·9
11 00 "	11·2	0·2	0·6	7·6	5·5	8·3	66·6	22·0
12 00 "	9·9	0·4	0·8	8·2	5·2	9·4	66·1	20·6
1 00 a.m	10·3	0·6	0·8	8·9	6·4	8·7	64·3	24·8
2 00 "	10·5	0·3	0·6	9·1	5·6	10·3	63·6	25·6
2 30 "	10·3	0·0	1·9	8·4	10·1	10·6	58·7	31·0
4 00 "	11·7	0·3	1·1	7·8	6·8	8·1	64·2	23·8
5 00 "	10·8	0·3	0·8	10·5	5·6	12·2	59·1	29·8
6 00 "	12·7	0·4	0·2	10·7	4·3	17·2	54·5	32·4
7 00	13·9	0·3	0·3	7·6	3·6	13·1	61·2	24·6

OBSERVATIONS OF GAS METER AND B.H.P.

Date— January 11 and 12, 1909. Trial Number—19.

Notes: B.O. indicates that there is a surplus amount of gas blowing off to the atmosphere. N.B.O. indicates that all the gas is passing to the gas engine.

Time.	Main gas meter readings	Cubic feet in interval.	Remarks.	Time.	Loads on tight and slack sides of brake.		Net load on brake.	Revolutions counter reading on side shaft.
	cub. ft.				lbs.	lbs.	lbs.	
9 00 a.m.	1110710		N.B.O.	. . .	300	105	195	16919
9 30 "	1111550	840	B.O.	. . .	300	105	195	
10 00 "	1113080	1530	N.B.O	. . .	300	105	195	
10 30 "	1114820	1740	"	10 40 a.m.	325	125	200	28000
11 00 "	1116320	1500	"	. . .	325	125	200	
11 30 "	1117770	1450	"	.	325	125	200	
12 00 noon	1119075	1305	"	.	325	125	200	
12 30 p.m.	1120550	1475	"		325	125	200	
1 00 "	1122110	1560	"	. . .	325	130	195	43340
1 30 "	1123780	1670	"	. . .	325	130	195	
2 00 "	1125510	1730	"	. . .	325	130	195	
2 30 "	1427275	1765	"		325	130	195	
3 00 "	1428750	1475	"		325	130	195	
3 30 "	1430280	1530	"		325	130	195	
4 00 "	1431880	1600	"		325	130	195	
4 30 "	1433590	1710	"	. . .	325	130	195	
5 00 "	1435200	1610	"	.	325	130	195	
5.30 "	1436800	1600	"	. .	325	130	195	
6.00 "	1438600	1800	"	. . .	325	130	195	
6 30 "	1440230	1630	"	. . .	325	130	195	
7.00 "	1441725	1495	"	.	325	130	195	
7.30 "	1443160	1435	"	.	325	130	195	
8 00 "	1444650	1490	"	.	325	130	195	
8.30 "	1446080	1430	"		325	130	195	
9.00 "	1447530	1450	"	.	325	130	195	
9 30 "	1448950	1420	"	. . .	325	130	195	99100
10.00 "	1450300	1450	"		325	130	195	
10 30 "	1451760	1460	"	. . .	300	118	182	05650
11 00 "	1453110	1350	"		300	118	182	
11.30 "	1454410	1300	"	. . . . .	300	118	182	
12.00 "	1455650	1240	"	. . .	300	118	182	
12.30 a.m.	1456892	1242	"	. . .	300	118	182	
1.00 "	1458265	1373	"		300	118	182	
1.30 "	1459710	1445	"	. .	300	118	182	
2.00 "	1461015	1305	"	.	300	118	182	
2.30 "	1462285	1270	"	. . . .	300	118	182	
3.00 "	1464518	1233	"	. . .	300	118	182	
3.30 "	1464782	0264	"	Engine running light 3.15 a.m.-3.30 a.m.				
4 00 "	1466185	1403	"	. . . .	300	118	182	
4.30 "	1467625	1440	"	. . . .	300	118	182	
5.00 "	1469020	1395	"	. . . . .	300	118	182	
5.30 "	1470455	1435	"	5 45 a.m. Engine stopped.				53079
6.00 "	1471820	1365	B.O					
6.30 "	1472810	0990	"					
7.00 "	1473760	0950	"					

OBSERVATIONS OF GAS CALORIMETER AND COAL.

Date—January 11 and 12, 1909.

Trial Number—19.

Note: Boys Calorimeter used.

Time	Gas Temp. °F.	Cubic Feet of Gas.	Water Temp. Deg. Cent.		Cubic Centimeters of Water.	B.T.U. per Cubic Foot.	Time	Coal Charged.	Total Coal.	Time of Poking.
			Inlet	Outlet						
9.00 a.m.	59	⅓	8·59	17·95	1610	177·7	9 00 a.m.	lbs.	lbs.	
9.30 "	60	⅓	7·00	14·22	1620	139·0	9.35 "	50	50	
10 00 "	61	⅓	5·71	12·01	1700	127·4				
10.30 "	60	5/12	5·17	14·32	1660	144·3	10.40 "	50	100	10 05 a.m.
11.00 "	62	5/12	5·69	13·76	1650	126·0	11.20 "	50	150	10 30 "
11.30 "	62	5/12	5·48	14·48	1630	139·4	11.35 "	50	200	11 35 "
12 00 noon	63	5/12	5·81	13·90	1675	128·7	12 05 p.m.	50	250	
12.30 p.m.	63	5/12	6·09	15·00	1640	138·7	12 45 "	25	275	
1.00 "	63	5/12	6·30	14·21	1670	125·3	1 05 "	50	325	
1.30 "	64	5/12	6 43	14·58	1650	127·7				
2 00 "	63	5/12	6·45	14·19	1665	121·7	2.15 "	50	375	
2.30 "	63	5/12	6·48	13·77	1910	132·2				
3 00 "	64	⅓	6·32	12·91	1600	125·3				
3 30 "	64	⅓	6·37	12·68	1650	112·0	3·35 "	50	425	
4 00 "	64	⅓	6·01	12·19	1758	129·2	4·18 "	50	475	
4.30 "	64	⅓	5·95	11·45	1905	121·5				
5 00 "	64	⅓	5·95	11·18	1975	122·7	5.05 "	50	525	
5.30 "	64	⅔	6·13	17·48	1740	117·4				
6 00 "	63	½	5·98	15·20	1610	117·7	6.05 "	25	550	6 00 p.m.
6.30 "	63	½	5·90	13·50	1820	109·7				
7 00 "	63	½	6·15	17·35	1820	161·5	6.55 "	100	650	6 50 "
7 30 "	63	½	6·31	18·54	1770	175·5	7 25 "	50	700	
8 00 "	63	½	6·21	17·81	1730	159·0	7.55 "	25	725	
8.30 "	63	½	6·22	16·91	1695	143·5	8.20 "	50	775	
9 00 "	63	½	6·15	14·58	1710	114·2	9.00 "	50	825	9 10 "
9.30 "	63	½	5·95	17·20	1730	154·2	9.15 "	50	875	
10.00 "	62	½	5·76	16·06	1720	140·3	9·55 "	50	925	9 50 "
10 30 "	62	½	5·65	16·68	1750	152·8	10.25 "	75	1000	
11.00 "	61	½	5·81	15·93	1800	144·0				
11 30 "	61	½	5·24	18·91	1760	190·5	11.25 "	100	1100	11 20 "
12 00 a.m.	60	½	4·74	16·09	1745	157·0	11.55 "	50	1150	
12 30 "	60	½	4·63	13·28	1740	119·5	12 30 a.m.	50	1200	12 28 a.m.
1.00 "	60	½	4·97	13·94	1860	149·0	12.55 "	50	1250	12 55 "
1.30 "	60	½	5·37	16·25	1750	151·0	1.25 "	50	1300	1.25 "
2 00 "	62	½	6·26	15·78	1760	132·7	2 00 "	50	1350	1.55 "
2 30 "	65	½	6·48	17·44	1720	149·2	2.30 "	50	1400	2.25 "
3 00 "	66	½	6·82	18·46	1750	161·5	3.00 "	50	1450	3 00 "
3 30 "							3 35 "	50	1500	3 35 "
4 00 "	65	½	6·57	18·17	1840	169·0	3.50 "	50	1550	4 05 "
4 30 "	65	½	6·42	15·17	1775	123·0				
5 00 "	64	½	6·36	16·78	1730	142·3	4.45 "	75	1625	5 25 "
5 30 "	63	½	6·27	16·08	1730	134·3	5 30 "	50	1675	
6.00 "	63	½	6·43	15·57	1700	123·2				
6 30 "	63	½	6·44	14·70	1730	113·3				

OBSERVATIONS OF TEMPERATURES AND PRESSURES.

Date—January 11 and 12, 1909. Trial Number—19.

Note: †Load eased.

Time.	Temperatures. °F.				Pressure. Ins. of Water.				Suction. Ins. of Water.		Steam Pressure.	
					Meter.		Exhauster.				lbs. per sq. in.	
	Producer Outlet.	Gas at Meter.	Room.	Engine Cooling Water.	Outlet.	Inlet.	Outlet.	Inlet.	Gas Washer Inlet	Producer Outlet.	Inlet.	Outlet.
9.00 a.m	610	62	63	135	3·7	6·0	6·2	7·8	7·0	1·0	69	67
9.30 "	600	62	64	118	3·5	6·0	6·2	7·4	6·4	1·0	66·5	66
10.00 "	560	62	64	124	3·0	5·6	5·8	8·7	8·0	1·9	63	62
10.30 "	690	64	63	110	3·6	5·4	5·6	8·8	8·0	1·2	69	67
11.00 "	610	64	65	119	3·2	5·6	5·8	7·4	6·6	1·9	62	60
11.30 "	630	64	65	196	3·4	5·1	5·2	8·6	7·7	2·0	61	59
12.00 "	600	66	66	128	3·1	4·5	4·7	6·9	6·0	1·7	55	54
12.30 p.m.	620	66	66	129	3·3	4·7	4·9	7·7	6·8	1·7	64	62
1.00 "	650	67	66	127	3·4	5·5	5·7	8·7	8·0	1·7	63	60
1.30 "	670	68	66	135	3·4	5·2	5·4	8·5	7·7	1·8	61	56
2.00 "	680	68	65	130	3·4	5·1	5·3	8·1	7·5	1·4	48	45
2.30 "	660	68	65	132	3·4	5·0	5·2	7·4	6·5	1·4	47	43
3.00 "	650	68	65	132	3·4	5·0	5·2	7·5	6·8	1·6	44	40
3.30 "	640	68	65	130	3·3	5·0	5·2	7·7	7·0	1·4	57	55
4.00 "	660	68	65	131	3·3	4·9	5·1	7·9	0	1·5	69	67
4.30 "	680	68	65	127	3·7	5·5	5·7	9·0	4	1·4	71	68
5.00 "	670	68	65	130	3·3	4·5	4·7	7·6	0	1·3	64	60
5.30 "	660	68	65	135	3·4	4·5	4·7	7·9	7·0	1·3	67	65
6.00 "	650	67	62	134	3·7	5·0	5·2	9·6	8·3	1·7	59	56
6.30 "	640	67	63	134	3·5	4·5	4·7	8·0	7·3	1·7	46	43
7.00 "	660	68	63	130	3·4	0	4·2	8·5	7·5	1·9	38	36
7.30 "	660	68	64	133	3·5	4·0	4·2	8·6	7·4	1·6	39	35
8.00 "	660	68	64	145	3·4	4·0	4·2	8·6	8·0	1·9	43	40
8.30 "	640	68	65	139	3·4	3·6	3·9	9·0	8·1	2·0	39	37
9.00 "	650	68	63	137	3·2	3·5	3·7	8·3	8·5	1·8	42	39
9.30 "	660	68	63	130	3·2	3·6	3·5	9·1	8·3	2·5	44	41
10.00 "	640	68	62	127	2·8	3·0	3·2	8·8	8·0	1·9	45	43
10.30 "	670	67	61	121	3·3	3·6	3·8	9·4	8·5	2·1	38	36
11.00 "	640	67	61	127	3·1	3·1	3·3	8·4	8·0	1·7	34	30
11.30 "	650	66	60	118†	3·5	2·5	2·7	8·1	7·5	2·0	40	37
12.00 "	630	66	58	123	3·1	4·8	4·6	8·5	8·0	2·2	46	43
12.30 a m	640	66	58	122	3·2	5·3	5·5	9·9	8·6	2·7	45	43
1.00 "	640	66	59	123	3·1	5·3	5·5	9·4	8·4	2·4	31	28
1.30 "	650	66	60	124	3·2	5·4	5·6	9·0	8·1	2·3	38	36
2.00 "	620	66	69	126	3·0	4·8	5·0	8·3	7·5	2·3	48	46
2.30 "	640	70	71	125	2·9	4·8	5·0	8·0	7·0	2·2	57	55
3.00 "	620	72	73	128	3·0	4·8	5·0	8·0	7·2	1·8	63	60
3.30 "	600	74	74	125	3·2	5·2	5·4	8·4	7·4	1·5	62	59
4.00 "	640	73	70	117	3·2	5·2	5·4	9·4	......	1·0	47	45
4.30 "	600	70	66	128	3·3	5·4	5·6	8·6	......	1·1	35	32
5.00 "	570	66	64	124	2·9	4·6	4·8	10·4	......	1·4	26	22
5.30 "	600	64	54	126	3·3	6·0	6·2	12·5	......	2·2	26	22
6.00 "	570	64	53	......	2·8	3·8	4·0	6·7	......	0·9	31	25
6.30 "	530	64	63	......	2·7	3·8	4·0	7·2	......	1·1	42	33

PRODUCER TRIAL No. 19.

Date—January 11-12, 1909. Producer No. 4, at McGill University.

Time of lighting up—3.30 a.m. Trial commenced 9 a.m. January 11; ended 7 a.m. January 12.

Duration of trial—22 hours. Kind of fuel—No. 17 coal.

Observers and staff during trial—Cameron, Killam, Gardner.

Computers—Killam, Cameron.

Chemists—Campbell, Stansfield, Nicolls.

SUMMARY OF OBSERVATIONS.

Fuel.

1.	Total coal charged during trial		
2.	Moisture in coal as charged	lbs.	1675
3.	Calorific value of coal as charged, per lb.	per cent.	2·0
4.	“ “ of dry coal per lb.	B.T.U.	12220
5.	Proximate analysis of coal as charged (by weight): fixed carbon,	B.T.U.	12470
	41·5; volatile matter, 39·7; ash, 16·8; moisture, 2·0	per cent.	
6.	Combustible in dry refuse removed during trial: fixed carbon,		
	65·6; volatile matter, 6·2 ... Total	per cent.	71·8
7.	Average depth of fuel bed (measured from centre of gas outlet)	ins.	42·1

Gas.

8.	Total gas produced during trial (from meter readings)		
9.	Average temperature of gas leaving producer	cub. ft.	63050
10.	“ “ “ at meter	°F.	634
11.	Average temperature of air in producer house	°F.	67
12a.	Average higher calorific value of gas per cub. ft. by calorimeter	°F.	64
	(as observed)	B.T.U.	138·3
12b.	Average higher calorific value of gas per cub. ft. by calorimeter		
	(gas dry at 60° and 14·7 lbs. per sq. in.)	B.T.U.	142·1
13.	Average lower calorific value of gas per cub. ft. by calorimeter (gas		
	dry at 60° and 14·7 lbs. per sq. in.)		
14.	Average barometric pressure	B.T.U.	130·4
15.	“ suction at producer	lbs. sq in.	14·67
16.	“ suction at exhauster	ins. of water	1·7
17.	“ pressure of gas at meter	ins. of water	8·5
		ins. of water	4·12

Steam, Water, Etc.

18.	Total steam used in producer during trial		
19.	“ water used in scrubber and gas washer	lbs.	1980
20.	“ tar extracted in scrubber and gas washer	lbs.	36110
21.	Average power required to drive exhauster	lbs.	17
22.	“ “ “ gas washer	H.P.	2·5
		H.P.	1·0

Engine.

23.	Total revolutions during trial (from counter)		
24.	Average explosions per minute		272320
25.	Average effective load on brake		101·6
26.	Effective radius of brake wheel	lbs.	1892
27.	Average mean effective pressure from indicator diagrams	ft.	3·836
		lbs. sq. in.	65·8
28.			

Notes.

Fire poked at: 10.05, 10.30, 11.35 a.m.; 6.00, 6.50, 9.10, 9.50, 11.20 p.m., 12.28, 12.55, 1.25, 1.55, 2.25, 3.00, 3.35, 4.05, 5.25.

Refuse removed at: 10.35, 11.05 a.m.; 12.05, 1.35, 3.35, 6.05, 6.50, 8.15, 9.00, 9.55, 11.20 p.m., 1.25, 1.57, 2.20, 3.00, 3.35, 3.50, 5.35 a.m.

Behaviour of coal: Required much attention

Average time between poking: 1 hour, 18 minutes.

Tar: Trouble from tar.

Clinker: No trouble recorded.

State of engine valves at end of trial: Badly tarred

Valves last cleaned: Jan. 9, 1909

29. **Analysis of Dry Coal.**

Hydrogen	4·6%
Carbon	69·0%
Nitrogen	1·2%
Oxygen	12·0%
Sulphur	1·3%
Total carbon contained by dry coal charged	1131·0 lbs.

30. **Analysis of Gas by Volume.**

Carbon dioxide	11·0%
Oxygen	0·3%
Carbon monoxide	10·0%
Hydrogen	12·5%
Methane	4·6%
Ethylene	0·6%
Nitrogen	61·0%

REMARKS.

The coal required a good deal of attention, but gave off a good gas. Considerable difficulty was encountered with deposits of tar on the valves and in the gas washer.

SUMMARY OF RESULTS.

TOTAL QUANTITIES.

No.	Item	Unit	Value
31.	Dry coal charged during trial		
32.	Combustible charged during trial	lbs.	1640
33.	Average B.H.P. of engine during trial	lbs.	1360
34.	" indicated H.P. of engine during trial	H.P.	30·32
35.	" H.P. taken by exhauster and gas washer	H.P.	38·25
36.	" B.H.P. while gas consumption of engine was taken	H.P.	3·5
37.	" " corresponding to total gas produced	H.P.	30·32
38.	" " " " " " and available	H.P.	30·32
	for outside use, allowing for power used	H.P.	26·82

HOURLY QUANTITIES.

No.	Item	Unit	Value
39.	Coal charged per hour		
40.	Dry coal charged per hour	lbs.	76·1
41.	Combustible charged per hour	lbs.	74·5
42.	Coal charged per sq. ft. of fuel bed per hour	lbs.	61·8
43.	Dry coal charged per sq. ft. of fuel bed per hour	lbs.	19·0
44.	Combustible charged per sq. ft. of fuel bed per hour	lbs.	18·6
45.	Coal (as charged) per hour equivalent to power used for auxiliaries	lbs.	15·5
46.	Coal (as charged) per hour equivalent to steam used in producer	lbs.	8·82
47.	Gas (by meter) supplied by producer per hour	lbs.	12·3
48.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied by producer per	cub. ft.	2865
	hour		
49.	Gas (by meter) supplied to engine per hour while gas consumption	cub. ft.	2786
	was taken		
50.	Gas (dry at 60° and 14·7 lbs. per sq. in.) supplied to engine per	cub. ft.	2865
	hour while gas consumption was taken		
51.	Calorific value of coal charged per hour	cub. ft.	2786
52.	" " gas produced per hour (lower value)	B.T.U.	930000
53.	Steam used in producer per hour	B.T.U.	363500
		lbs.	90

ECONOMIC RESULTS.

No.	Item	Unit	Value
54.	Gas (dry at 60° and 14·7 lb [illegible] sq. in.) produced per lb. of coal		
	charged		
55.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced dry coal charged	cub. ft.	36·5
56.	Gas (dry at 60° and 14·7 lbs. per sq. in.) produced per lb. of com-	cub. ft.	37·4
	bustible charged		
57.	Gas (dry at 60° and 14·7 lbs. per sq. in.) used per I.H.P. per hr.	cub. ft.	45·2
58.	" " " " " " B.H.P. "	cub. ft.	72·8
59.	Steam used in producer per lb coal charged	cub. ft.	92·0
60.	Water used in scrubber and gas washer per lb. coal charged	lbs.	1·18
61.	Water used in scrubber and gas washer per 1000 cub. ft. gas pro-	lbs.	21·5
	duced		
62.	Efficiency of process of gas production and cleaning, based on coal	lbs.	572·0
	charged		
63.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	39·0
64.	Efficiency of producer plant allowing for power used for auxiliaries	per cent.	34·6
	and for steam used in producer	per cent.	29·9
65.	Thermal efficiency of engine, based on B.H.P	per cent.	21·2
66.	Over all efficiency of producer and engine plant	per cent.	8·26
67.	Calorific value of gas supplied to engine per B.H.P. per hour	B.T.U.	12000
68.	" " coal charged into producer per B.H.P. per hr.	B.T.U.	30790

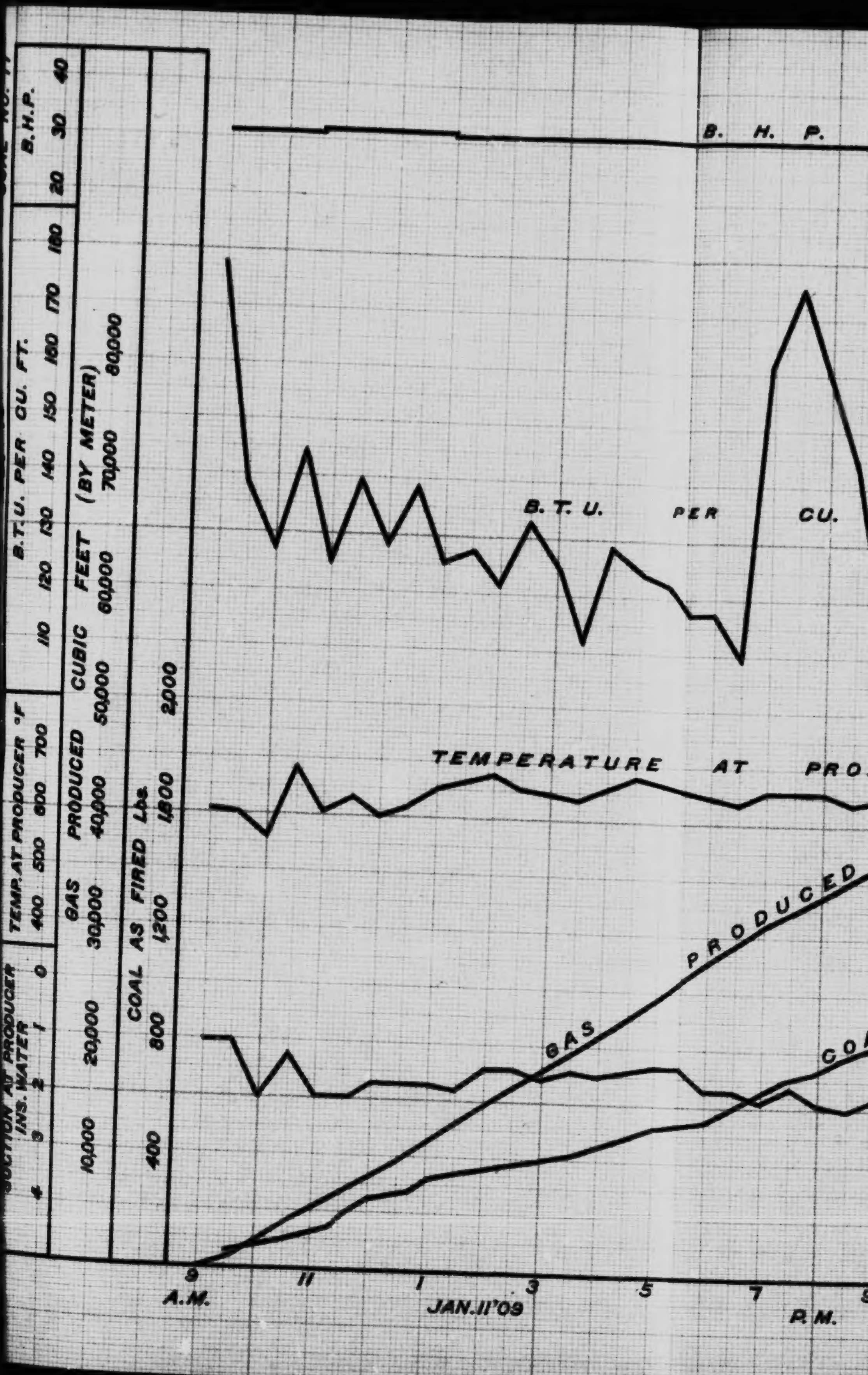
No.	Item	Coal as charged.	Dry coal.	Combustible.
69.	Pounds per hour charged into producer per B.H.P. developed by engine			
70.	Pounds per hour charged into producer per B.H.P. available for outside use and allowing for power used by auxiliaries	2·52	2·47	2·05
71.	Pounds per hour charged into producer per B.H.P., allowing for power	2·84	2·78	2·30
	and also for steam used by producer	3·29	3·22	2·67

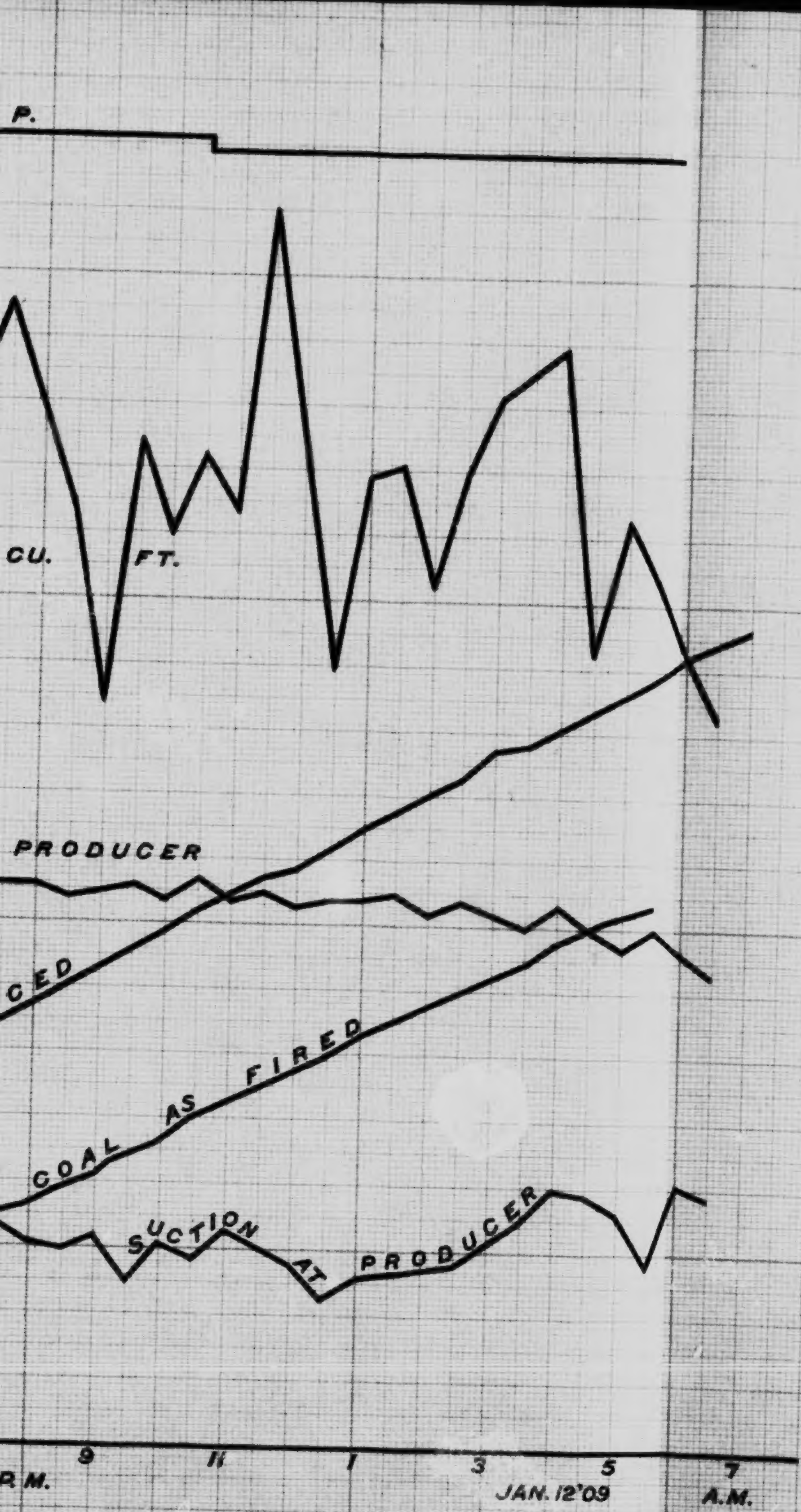
a good gas. Considerable
nd in the gas washer.

....	lbs.	1640
....	lbs.	1360
....	H.P.	30·32
....	H.P.	38·25
....	H.P.	3·5
n........	H.P.	30·32
....	H.P.	30·32
vailable	H.P.	26·82
....	lbs.	76·1
....	lbs.	74·5
....	lbs.	61·8
....	lbs.	19·0
....	lbs.	18·6
....	lbs.	15·5
xiliaries	lbs.	8·82
ducer..	lbs.	12·3
....	cub. ft.	2865
cer per	cub. ft.	2786
mption	cub. ft.	2865
ine per	cub. ft.	2786
....	B.T.U.	930000
....	B.T.U.	363500
....	lbs.	90
of coal	cub. ft.	36·5
harged	cub. ft.	37·4
f com-	cub. ft.	45·2
hr....	cub. ft.	72·8
...	cub. ft.	92·0
......	lbs.	1·18
......	lbs.	21·5
s pro-	lbs.	572·0
n coal	per cent.	39·0
iaries	per cent.	34·6
iaries	per cent.	29·9
.....	per cent.	21·2
.....	per cent.	8·26
.....	B.T.U.	12000
hr...	B.T.U.	30790
al as ged.	Dry coal.	Combustible.
52	2·47	2·05
84	2·78	2·30
29	3·22	2·67

COAL NO. 17

PRODUCER TRIAL NO. 19


B.H.P.
20
30
40
B.T.U. PER CU. FT.
110
120
130
140
150
160
170
180
TEMP. AT PRODUCER °F
400
500
600
700
SUCTION AT PRODUCER INS. WATER
4
3
2
1
0
GAS PRODUCED CUBIC FEET (BY METER)
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
COAL AS FIRED Lbs.
400
800
1200
1600
2000
B. H. P.
B. T. U. PER CU.
TEMPERATURE AT PRO
GAS PRODUCED
CO
9
11
1
3
5
7
9
A.M.
JAN. 11'09
P.M.



APPENDIX III VOL.V